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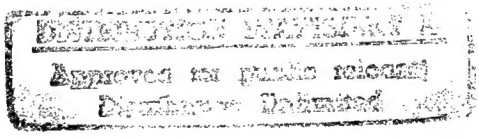

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ADVANCED MATERIALS

EC: Sol-Gel Glass, Ceramics Treatments Reviewed

92WS0438A Paris INDUSTRIES ET TECHNIQUES in French No. 721, 28 Feb 92 pp 20-21

[Article by Michel Le Toullec: "New Youth for Glasses and Ceramics -A 'Gentle Chemistry' for Customizing of Materials"; first paragraph is INDUSTRIE ET TECHNIQUES introduction]

[Excerpts] Treatment in solution by the sol-gel process yields products endowed with astonishing electronic, optical, and chemical properties.

Glasses and ceramics should no longer be thought of as "old" materials. Treated by an original technique, the sol-gel process, they have taken on new youth. This process yields improvements in their optical, electrical, and/or chemical properties, and enables the production of these materials by a "gentle" method, so to speak.

Generally speaking, the manufacture of glasses and ceramics begins with the heating of powders to temperatures exceeding 1000°C. "The sol-gel process, on the contrary, takes place in solution and at far lower temperatures. It also enables almost continuous in-process control of the forming of the materials being produced," says Jacques Livage, head of the Condensed Chemistry Laboratory at Jussieu (Pierre-and-Marie Curie University) and leader of the Coordinated Research Group [GRECO] on this topic. These advantages are at the origin of ambitious applications: Coatings with sophisticated optical properties, highly homogeneous ceramics for electronics, fibers drawn at almost ambient temperatures, ultraselective filtration membranes, etc.

The first to have exploited this process industrially was Germany's Schott Glaswerke, producer of glass pane for buildings, among other things. The manufacturer's intent was not to produce panes by the sol-gel process, but rather to impart antireflection and insulating properties to them by surface treatment. Today, Schott Glaswerke produces several million square meters of antireflection glass pane by means of an astonishingly simple procedure. The glass is dipped in a precursor solution (see box [at end of article]). After polymerization in air, the final coating of titanium oxide is obtained by heating to around 400°C. This technique, known as dip coating, and widely used industrially, also yields very uniform coatings on large-sized panes. The process is also applied to multilayer depositions (oxides of silicon, titanium, indium) used to maximize control of the pane's reflection coefficient. The CEA's [Atomic Energy Commission's] research center at Limeil-Valenton is working on antireflection coatings for lenses and mirrors for use in power lasers. The CEA's Phebus laser, used for the study of laser-matter interactions, is equipped with lenses treated by this process. The optical coating is obtained by dipping or centrifugal deposition of a colloid containing several oxides (titanium, aluminum, silicon, thorium) in suspension. After drying at ambient temperature, a thin layer of oxide less than 1 micron thick remains that is capable of withstanding the laser's energy. After developing these lenses, measuring 80 cm in diameter, the team addressed the antireflection coating of lenses having a diameter of over 1 meter. This involved coatings consisting of tens of alternated layers of various oxides and silicon.

All of these coatings are characterized by a tiny fault: Their porosity, resulting from the evaporation of the solvent. That need not be an obstacle, was the view at ENSCM [Montpellier National Advanced School of Chemistry]: In fact, why not take advantage of it... for the manufacture of filter supermembranes? "The principle consists of depositing a thin layer of oxide on a substrate of alumina, graphite, or sintered metals. This yields a membrane whose pores are around some 10 Angstroms versus 1,000 or more Angstroms for the substrate." The reasoning paid off, in that these membranes have been produced for the past five years by Carbone Lorraine, Tech-Sap (a Rhone-Poulenc subsidiary), and SCT [Technical Ceramics Company]. Their principal industrial users are: The agricultural foods industry, for the processing of bottled waters, wine, and milk; the chemical industry, as catalyzers and separators; and the pharmaceuticals industry.

The sol-gel process also opens the way to the production of thin layers with astonishing electrical and electronic properties. "This concerns especially the gels of transition-metals oxides (vanadium, tungsten, titanium, etc...), ferroelectric materials, and superconductors," says Jacques Livage. [passage omitted].

"Owing to their relatively high viscosity, gels can be drawn at close to ambient temperatures," says Jacques Livage. "In the case of glass or ceramic fibers, the transformation takes place after heat treatment at around 400 to 500°C, depending on the starting mixture." The program includes the production of silicon, alumina, zirconium, and silicon carbide fibers. In the case of glass, the method eliminates, in particular, the risk of crystallization during the drawing process. Japan's Hitachi and AT&T's Bell Labs are working on applying this method to produce preforms of silicon optical fibers for telecommunications. The method limits the presence of impurities and reduces the problems of homogeneity, which are significant causes of optical losses along the fibers.

In ceramics, Great Britain's ICI manufactures its Saffil alumina fiber by extrusion of a "paste" of aluminum salts. Heat treatment transforms the salts into aluminum oxide. This alumina fiber is used in the form of wool for the thermal insulation of very-high-temperature ovens. [passage omitted]. In the case of fibers consisting of a mixture of oxides, the sol-gel process yields a highly homogeneous mixture of ingredients at the molecular level. Fibers of this type are used for the insulation of ovens, but also as reinforcement in composites.

The sol-gel process is also increasingly being applied in the manufacture of ceramic powders. This application is justified in that the use of precursors in solution permits working with extremely pure starting products—obtained by distillation—and with very tightly bonded mixtures at the molecular level. To this first advantage, the process adds a second one, of capital importance to the ceramics manufactures: Virtually perfect control of the morphology of the individual grains of powder. At the CEA in Saclay, the process is applied to the synthesis of refractory ceramics such as silicon carbide and, in particular, the oxides of erbium and hafnium. Its work has yielded powders of very high specific surfaces, that is, likely to he highly reactive. This makes for easier use of the powder at a lower temperature of densification by sintering, which limits the risk of pollution. The Chemistry of Solids Group at the Palaiseau Polytechnic Institute has patented a process for preparing barium titanate, a dielectric material used in multilayer capacitors. The method, developed together with Thomson-LCC, produces, at moderate temperatures, a very pure submicronic powder. Rhone-Poulenc, for its part, has prepared superconducting powders (YBaCuO) yielding virtually unpolluted, hence conductive, ceramic grain bonds. The company is also seeking a process to optimize the characteristics of the polyphosphates used in detergents.

The manufacture of massive (termed monolithic) pieces by the sol-gel process appears to be unanimously opposed. "The proportion of solvent necessary is such—being of the order of 80 percent—that it is difficult to evaporate it without the risk of cracking the material," says Louis Cot, head of the Montpellier Institute of Chemistry. [passage omitted].

But the future of the sol-gel approach does not lie in that direction. Its major challenge is unquestionably in the area of mixed mineral and organic materials. The originality of this chemistry lies in the capability it offers for mixing, in solution, mineral and organic products, even though the latter are generally eliminated by heating. One of the most advanced groups in this domain is the Fraunhofer Institute in Stuttgart. These silicon-based hybrid materials, the Ormosils, are being developed industrially as coatings with applications in the biomedical field and for certain corneal lenses. Anti-abrasive coatings for organic glass is of keen interest to Essilor. Louis Cot's team at Montpellier is developing mixed coatings for "intelligent" membranes. "These are oxides onto which organic functions have been grafted that can be hydrophilic or hydrophobic. It is possible to imagine facilitated-transport membranes, in which an ion would be captured by an organic function, transported, and jettisoned at a more distant point. The way is also open to the separation of small molecules of gas from mixtures of organic solvents, at high temperatures, and the filtration of very small ions for de-pollution, neither of which present-day organic membranes are able to do..." In any case, the sol-gel approach provides a new corridor between organic and mineral chemistry. [box omitted].

AEROSPACE

Italy: First Test Launch of San Marco Scout Completed

92MI0443 Rome SPAZIO INFORMAZIONI in Italian 1 Apr 92 pp 2-4

[Text] The event took place about 10 days ago, far from prying eyes, at the Interforces Experimental Launch Site (SPERINTER) at Perdasdefogu (Nuoro) [Sardinia]. SPAZIO INFORMAZIONI is able to publish an exclusive account of the preparations and outcome of the "top secret" first launch of what should be the "technological engine" for the future Italian Zefiro stage designed by the space division of BPD to replace the U.S. Algol booster in the San Marco Scout carrier. According to a reliable source, the 10-meter high experimental missile, loaded with over 10 tonnes of solid propellant and equipped with two inert lateral boosters to function principally as ballasts, was positioned vertically on an ad hoc launch pad constructed by BPD in Sardinia. This missile, which was equipped with a new type of guiding equipment, is the outcome of the boosters developed by BPD for the European Ariane-4 carrier although its solid-fuelling coefficients are different. When the countdown was completed and with sophisticated tracking and telemetry equipment ready to collect data on the mission the missile rose smoothly from the launch-pad and followed the projected trajectory for some 10 seconds. Then a technical fault (it is still not clear whether the fault was in the booster or guiding system) caused the missile to curve in another direction forcing BPD's technicians to activate the autodestruct mechanism. A perfect recording of all the phases of the flight should allow the fault to be identified and corrected.

When contacted by SPAZIO INFORMAZIONI, the press office at Gilardini (which is headed by BPD within the Fiat Group), confirmed the facts: "Yes, a launch was made as a follow-up to a series of tests carried out last year and others will be carried out in the coming months." Piergiorgio Romiti, director of BPD Spazio, when contacted by SPAZIO INFORMAZIONI in Switzerland admitted that: "The launch in Sardinia was the first this year and gave us the data we expected. We are, however, keeping the results to ourselves. In any case we will be proceeding with the development of the San Marco Scout.

The Price War

The so-called "Italianization" of the San Marco Scout follows the granting by the Italian Space Agency (ASI) of a 120-billion lire contract to BPD. This carrier was originally conceived many years ago by the well-known Prof. Luigi Broglio, director of the San Marco project and the "father" of Italian space activities. Several months ago ASI approved 90 billion lire in funding over a three-year period (the funds do not, however, appear to be available yet) to construct the first prototype of the

San Marco Scout launching site in Kenya. This ambitious program has been entrusted to Prof. Broglio and La Sapienza University in Rome. This first prototype, which would almost exclusively use subsystems produced in the United States, should launch the scientific satellite Equator-S into orbit from the Kenya launch site in mid-1994. BPD also recently confirmed that it will be ready to launch the first Italian version of the San Marco Scout (which in some internal documents is referred to as SMS-A2) in 1995. This version will be characterized by all-Italian boosters, first stage, guiding system, and heat shields. The real problem now is the cost and competition. For some time now a fierce price war has been raging between the two main competitors in the international market: the Pegasus designed in the United States by Orbital Sciences (OSC), and Hercules, and the San Marco Scout. During a call for bids by NASA involving the launch of several small scientific satellites, Pegasus demolished the Italian competitor by proposing a cost of only $6 million for each launch. Recently OSC has been forced to actually double its price. Since then, however, San Marco Scout has been labeled as being too expensive. This was also stated in no uncertain terms by Prof. Roger Bonnet, director of the European Space Agency (ESA) Scientific Program during his recent visit to Rome. "The San Marco Scout is too expensive," said Bonnet, "and it must be made competitive with the Pegasus which in itself is still too expensive—especially when we are considering the launch of a small ESA scientific satellite every two years." Fiat Spazio President Giuseppe Grande pointed out: "The cost of a launch is related to the production flow of launchers and the site chosen for the launch. The Pegasus has increased from an initial $6 million and we are still trying to cut the cost." Romiti stated: "We have never actually presented a formal proposal to the ESA. However, our costs tend to be lower than the estimated costs and the Pegasus payload capacity is also inferior to ours." A BPD document reads: "Taking competition into account, the San Marco Scout carrier is aiming at a launch cost of between $12-15 million; that is considered to be attainable and very competitive." In other words, it would seem that the ball is still in play. One thing is certain however: Whoever wins will be guaranteed a market of at least five launches per year, with revenues of more than $60 million per year for the next 10 years. Before estimating how many chances our country has, we will have to patiently await the next "top secret" launch in Sardinia.

Italy: European Space Conference Summarized

92MI0444 Rome SPAZIO INFORMAZIONI in Italian 25 Mar 92 pp 4-5

[Text] "Today, Europe has a stable, high quality scientific space program. Such programs, whether on a national or an international level, are always the driving force behind new technologies. It is not always easy, but it is the way to make advances in science and knowledge." The program outcome of a recent round table session organized by the Italian Space Society (ISS), and ESRIN [European Space Research Institute] in Frascati (Rome), on the theme: "The Future of European Space Science: Strategies and New Programs," could perhaps be summarized with this statement by Prof. Roger Bonnet, director of the European Space Agency's (ESA) Scientific Program. Together with Prof. Bonnet, a number of representatives from the Italian and European space world attended the conference. Among them, Prof. Francesco Carassa, president of the ESA Council; Prof. Luigi Broglio, director of the San Marco Project; Prof. Remo Ruffini, president of the Italian Space Agency's (ASI) Scientific Committee; Antonio Rodata, Joint General Manager of Alenia Spazio, Guiseppe Grande, president of Fiat Spazio; and Marco Gerevini, president of Laben.

Prof. Bonnet also furnished some figures during his speech. In 1992, the scientific program will account for 9.8 percent of the ESA's total budget, equivalent to ECU266 million, compared with Italy's contribution, which amounts to 17.4 percent of the Agency's ECU396.6 million budget. "Although the member countries have already ensured the future of the scientific program, with the ESA Council's unanimous decisions in December 1990 to increase its resources," Prof. Bonnet stressed, "continued support by the scientific community and the national delegations is essential to enable the program to do its part, and to guarantee European science the preeminent position it deserves." Replying to a question by SPAZIO INFORMAZIONI on the possibility of Italian industry being entrusted with development of the proposed XMM scientific satellite for X-ray astronomy, Prof. Bonnet confirmed that: "A proposal does exist for the development of this satellite's platform in collaboration with Italy. Italian industrial capabilities are definitely of the level we deem necessary, but all the industrial proposals will be evaluated on a competitive basis to obtain the best result at the best price."

Prof. Broglio in turn stated that: "While there is no doubt that space activities lead to progress in science and technology, products also have to undergo major transformations before they can be used on a commercial scale." Prof. Broglio concluded by saying: "It is necessary, therefore, to clarify that while space programs do not provide immediate economic returns, they do make important contributions toward the solution of great planetary problems."

Italian, CIS Aerospace Accords Reported

Italian Delegation to Moscow

92MI0452A Rome SPAZIO INFORMAZIONI in Italian 25 Mar 92 p 2

[Text] "It was a very interesting exploratory trip," stated the ASI [Italian Space Agency] President Prof. Luciano Guerriero upon his return to Rome after a recent visit to Russia at the head of a delegation of representatives from the major Italian space companies, including Alenia Spazio and BPD. "Russia," stated Guerriero "is

willing to offer its skills in the space sector to whomever wishes to buy and use them, but the mechanism is not exactly clear yet. This should all be viewed within the framework of the European space program." He concluded by saying: "Of course, we are interested in expanding collaboration with Eastern Europe, but without penalizing Western companies." According to information obtained by SPAZIO INFORMAZIONI in diplomatic circles, this trip to Moscow actually represents "a preliminary visit to examine the various possibilities in a reality that is currently quite difficult." In the coming month of April, a new Italian mission is slated to go to Moscow, led by representatives of the Ministry of Foreign Trade together with experts from the Ministry of the Universities and Research and ASI representatives. The goals of this visit include renegotiating agreements and programs for bilateral cooperation in space activities, stipulated between Italy and the ex-Soviet Union some time ago.

Statement by Cosmonaut Strekalov

"We have always stated we were willing to collaborate with any country," the Russian cosmonaut Gennadiy Strekalov told SPAZIO INFORMAZIONI during his recent trip to Rome to participate in a conference organized by the Faculty of Engineering at La Sapienza University. Strekalov who currently works as a cosmonaut instructor for the Russian company Energiya stated: "We are waiting for Italy to formalize the agreements. Future collaboration depends mainly on Italy." He concluded by stating: "You always go to the United States to collaborate!"

Cooperation Agreement

92MI0452B Rome SPAZIO INFORMAZIONI in Italian 1 Apr 92 p 668

[Text] Italy is the first nation to sign a working agreement with the new Russian Academy of Sciences. It was signed on March 26 in Rome by Luciano Guerriero, ASI [Italian Space Agency] president and by Yuri Osipov, a representative from the Russian science institute, in the presence of Puri Purini, minister plenipotentiary. The agreement concerns Italian participation (through the ASI, astronomical observatories, universities, and scientific institutes) in developing instruments for use in the Russian Spectrum-X Gamma mission, slated for 1995 and includes the JET-X European telescope for X-ray astronomy; X-RSP, an X-ray polarimeter; and the MART telescope.

Germany: DLR Opens Research Center in Berlin

DLR Branch Established

92MI0487A Bonn BMFT JOURNAL in German Apr 92 p 2

[Text] The new German Aerospace Research Institute (DLR) research center has now started work in Berlin-Adlershof. This branch incorporates the Neustrelitz satellite ground station. The new DLR center will employ 300 people.

Hypersonic Wind Tunnel Completed

92MI0487B Bonn BMFT JOURNAL in German Apr 92 p 10

[Text] Its research work will focus on extraterrestrial research and earth observation from space and forms part of the German and European space program. There will also be considerable scope for joint projects with the Commonwealth of Independent States (1994 Mars mission). The Federal Ministry of Research and Technology (BMFT) is contributing 90 percent of the DLR center's basic finance.

High-Enthalpy Wind Tunnel Realistically Simulates Hermes Reentry

92WS0490A Stuttgart FLUG REVUE in German Apr 92 p 76

[Article by Volker Leuchsner: "Hermes Lands in the Lab: Realistic Simulations of Reentry"]

[Text] As the Hermes returns to earth, the air in front of its nose will heat up to temperatures of over 13,000°. The DLR's new wind tunnel in Goettingen is making it possible for the first time to investigate precisely the aerodynamic effects produced.

One of these days, when the European space glider Hermes enters the denser layers of earth's atmosphere at the end of a mission, enormous quantities of energy will be released by the high entry velocities. The real gas effects which are produced in the process (various kinds of chemical composition, ionization and dissociation) bring about a drastic change in the properties of the air. This influences the aerodynamic behavior of the space glider; the surface is exposed to extremely high temperatures, and radio communication can be disrupted by the ionization of the air. Since only one to two percent of the energy of reentry can be transferred to the vehicle, it is necessary to know the actual flow conditions precisely.

Until now, it was possible to simulate the Mach numbers in supersonic wind tunnels, but not the high air flow velocities or the temperatures which result from them. Now that the "Goettingen High-Enthalpy Wind Tunnel" (HEG) at the research center of the German Research Institute for Air and Space Travel (DLR) in Goettingen has been activated, a facility for simulating reentry realistically is available, with a construction which is unmatched anywhere in the world.

The HEG, which is 60 m long, is built on the principle of a compression tube with a free-moving piston. The piston is accelerated by pressurized air to rates of up to 300 m per second. This compresses the helium contained in the compression tube to a sixtieth of its volume. After the rupture of the first membrane, a compressional shock runs from left to right in the shock tube and compresses the air to 2,000 bar. In the process, the air is heated to 13,000 degrees. Immediately afterwards the second membrane ruptures and the test gas flows explosively

through the nozzle and reaches the wind tunnel model at a velocity of approximately 8,000 m per second.

The time period available to scientists for measurement is only 1.3 milliseconds. To measure the field of flow around the whole model, j especially in the vicinity of the stagnation point, where the temperatures are highest, two laser-supported measurement procedures were further developed for this use. The density distribution in the vicinity of the model is measured using the method of holographic interferometry. From this, pressure and flow rate can be deduced. With the help of laser-induced fluorescence, the composition of the gas and the temperature field can be determined.

Thus, using a miniature Hermes with a scale of 1:50 reveals not only the aerodynamics but especially the areas where the greatest heat is generated. Here real gas effects play a particularly large role. They cause the nose shock wave to be much closer to the space glider than calculations had predicted. This must be taken into account in developing heat protection. But flight properties are also affected. The pilot of the space shuttle, for which such wind tunnel investigations were not made, had to turn off the navigational computer during the first flight and correct the flap positions manually, since the calculated deflection was not sufficient.

In spite of many debates about European space flights, the high-enthalpy tunnel at Goettingen will be fully exploited in the future and will arouse world-wide interest. The tunnel is applicable in all cases where high friction losses occur because of high velocities, as in the return of space debris or meteorites. And through experiments designed to investigate the effect of high and rapidly flying aircraft on the composition of the upper atmosphere and the toxins which are produced, the HEG can also make an important contribution to environmental protection.

Italy: Alenia Spazio's 1991 Report Summarized

92MI0499 Rome SPAZIO INFORMAZIONI in Italian 29 Apr 92 pp 4-5

[Text] The revenues of Alenia Spazio, Italy's largest aerospace company, rose to 485 billion lire in 1991 compared to 435 billion lire in 1990. The figure rises further to 564 billion lire (481 billion lire in 1990) if the activities of its three subsidiaries Laben, Proel Technologie, and Space Software Italia are taken into consideration. This is what can be gathered from Alenia's annual report, recently presented at the shareholders' meeting held in Naples. Last year Alenia Spazio filled orders for 650 billion lire and has orders for 1.001 trillion lire while R&D expenditure totalled 142 billion lire. Employees totalled 2,126.

"Alenia Spazio," the report reads, "closed the 1991 working year with a profit of 576 billion lire, based on the usual cautious criteria of evaluation after earmarking 2.011 billion lire for bad debts and 19.237 billion lire for ordinary and anticipated depreciation. The year-end results were therefore affected by the consolidation of assets conducted within the limits set by fiscal regulations. The increase in corporate capital, implemented after the company became a branch of Alenia and underwritten by Italtel as a pro quota partner, made it possible to consolidate assets. This is reflected in a drop in net financial indebtedness and an improved coverage ratio for capital invested. Corporate capital therefore amounts to 74 billion lire, a 44 billion lire increase over 1990."

Market Situation

"The overall situation of the space market," reads the report, "remains favorable and with prospects of growth over the next decade, albeit with some uncertainties. The national market, which plays an extremely important role in the company's activities, is characterized by three important factors:

1) the approval by CIPE [Interministerial Committee for Economic Planning] of the National Space Plan which provides a formal reference point for the programs currently under way by the Italian Space Agency;

2) the approval by the Higher Council of Postal Communications of the SARIT (Italian Broadcasting Satellite) program for live television broadcasting drawn up by Alenia Spazio. This is of great importance since it justifies Alenia Spazio's investment in this sector and promotes the launching of a highly strategic program;

3) the progress of the SICRAL (Italian Satellite for Confidential Communications and Alarm) telecommunications program for defense, confirming Alenia Spazio's leading role. As for the ESA [European Space Agency] market, the ESA ministerial conference held in Munich last November, confirmed 1992 funding for programs of major interest to the company, and especially, Artemis, DRS [Data Relay Satellite], Columbus, Hermes, and the earth observation POEM [Polar Orbiting Earth Mission] program."

Ariane-44L Launch Uses New Third Stage

92WS0501A Paris AFP SCIENCES in French 9 Apr 92 pp 7, 8

[Article: "50th Flight of Ariane To Launch Telecom-2B and Inmarsat-2-Fr"]

[Text] Kourou—For its second flight of the year, on the night of 15-16 April between 2012 and 2057 hours (2312 and 2357 GMT), Arianespace is launching Telecom-2B and Inmarsat-2-Fr, its 79th and 80th satellites since 1981—this time with the help of Europe's most powerful rocket, an Ariane-44L equipped with four liquid-propellant boosters. The launch will be witnessed by Mr. Hubert Curien, who has just been given responsibility for all his government's space activities.

For this flight—which CNES [National Center for Space Studies] and ESA [European Space Administration] are

treating as a special event because it is the 50th launch since Ariane's debut in December 1979—Arianespace will utilize the launch rocket's new, more powerful third stage, the H-10 Plus. "With the H-10 Plus, we can demonstrate that the launch rocket could be improved still further, and we can give our two clients an even better orbit," says Mr. Patrice Albrecht, Arianespace's director of client services.

By burning for 28 more seconds, thanks to an additional 340 kg of propellant, this third stage "GTI" gives the Ariane 44L enough power to loft as much as 4,400 kg into geostationary orbit—a payload increase of 100 to 120 kg; this time around, however, the rocket will need to lift only 4,101 kg, the satellites themselves accounting for 3,585 kg of the total mass. When fitted with the H-10 Plus, which was developed by Aerospatiale and MBB/Erno under the auspices of CNES and ESA, the Ariane is now 32 cm longer.

Ariane will thus strengthen its position on the world space-launch market, where the competition will be getting tougher with the entry of Russia's "Proton" alongside the American "Atlas" and Chinese "Long March." Protons have been officially offered for the launches of third-generation Inmarsat satellites beginning in 1995.

The H-10 Plus was not scheduled to be used until the 55th Ariane, but with all tests complete, Arianespace preferred to give it a first demonstration as soon as possible, a month prior to the scheduled 18 May meeting in Paris of all its former and potential clients. If all goes well, that meeting should be marked by the signing of its 100th contract; there have been 97 so far since 1981.

Ariane has successfully orbited 78 satellites of every kind (though primarily communications satellites), and 31 more are still to be launched. After V-50, 29 satellites (totaling an estimated 12.8 billion French francs [Fr]) will remain in Arianespace's order book. On the night of 15-16 April, Arianespace will use the first of the 50 Ariane-4s ordered in February 1989 for a total of Fr24 billion: an eight-year order that has at last made space a real European industry.

Before now, nowhere in the world had rockets been produced in such great quantity, with the objective of high quality and productivity and concern to keep costs down. All of industry has participated in this effort, along with the Guiana Space Center (CSG), where a revamping of operational procedures and improvements in control procedures have cut five days off launch preparation time.

Ariane's Passengers

Telecom-2B, France Telecom's second second-generation satellite, which weighs 2,275 kg at take-off, is to provide telephone and television services between European France and our overseas departments (Antilles, Guiana, Reunion), communications services for the Defense Ministry, and company-to-company communications and television services here at home.

Built by Matra Marconi Space and Alcatel Espace, Telecom-2B (dimensions 3.10 x 1.90 x 2.60 meters) will be 22 meters in diameter with solar panels deployed. It is expected to operate in geostationary orbit for a minimum of 10 years and is equipped with 10 C-band repeaters, 5 X-band repeaters and 11 Ku-band repeaters. It is to be positioned on 3° East longitude, over the Gulf of Guinea.

Inmarsat-2-F4, the fourth second-generation satellite of the international maritime communications organization (Inmarsat), weighs 1,310 kg at take-off. It is to provide telecommunications links for aircraft, ships and terrestrial vehicles almost everywhere between the Arctic and Antarctica, including all of South America and the Atlantic Ocean, Central America, the Middle East and part of Africa.

Built by British Aerospace, it is supposed to be operational for a 10-year period, with an initial orbital position of 55° West longitude, i.e. over the western Atlantic. With solar panels deployed, its diameter is 14.9 meters, but it is smaller than its traveling companion (dimensions 2.4 x 1.6 x 1.6 meters). It will operate in the C to L and L to C frequency bands, handling up to 250 phone link-ups simultaneously.

Franco-Russian Antares Team Training at Toulouse

92WS0501B Paris AFP SCIENCES in French 9 Apr 92 p 9

[Article: "Franco-Russian Team Trains in Toulouse for Antares Mission"]

[Text] Toulouse—At the Toulouse Space Center of the National Center for Space Studies [CNES], crew members of the upcoming Franco-Russian "Antares" space mission, including Frenchman Michel Tognini, are familiarizing themselves with the French experiments to be carried aboard the Russian orbital station Mir.

The mission, which will last from 26 July to 9 August, is scheduled to conduct 10 experiments: six on the effects of weightlessness and cosmic radiation on humans, two having to do with physics, and two of a technological nature. The vessel will be commanded by Anatoliy Soloviev, who has already been in space twice (1988, 1990); ship's engineer will be Sergei Avdeiev, who has not been in space before.

The Antares mission is part of a long-term space cooperation program between France and Russia, which has assumed the commitments made by the former USSR, notably in the 10-year accord signed in 1989. In that regard, CNES officials and Russians with the NPO Energiya agency describe themselves as optimistic about the future of the Russian space program and possibilities for cooperation with Europe. In 1995, as another part of

the joint program, Jean-Pierre Haignere will have his own turn in space, replacing Tognini for the Antares mission.

The Antares program has both public and private-sector components, involving a commercial contract as well as cooperation between governments. For the first time, France will pay 73.2 million French francs [Fr] to cover the cost of sending 400 kg of equipment via an unmanned "Progress" rocket, cosmonaut training over a two-year period, and launch and recovery of the French team and 12 kg of experimental data.

As France's third man in space, Michel Tognini will follow in the footsteps of Jean-Loup Chretien (Salyut-7 in 1982, Aragatz-Mir in 1988) and Patrick Baudry (1985 on Discovery). Tognini and Haignere have been training at Star City near Moscow since January 1991. After their week of training at CNES in Toulouse, the cosmonauts will return to Moscow.

French Research and Space Minister Predicts Space Program Difficulties

92WS0514A Paris LE MONDE in French 15 Apr 92 p 11

[Article by Jean-Francois Augureau: "French Space Changes Hands"; first paragraph is LE MONDE introduction]

[Text] Mr. Beregovoy's government has transfered space affairs back to the research minister, Mr. Curien, who will not have much time to prepare for the European space conference scheduled for next November in Spain.

Hubert Curien had drifted away from space policy a bit over the last four years or so. Now that he has resumed responsibility for it as the new research and space minister, he can re-acquaint himself with an area of which he is especially fond. Mr. Curien was very active as president of the National Center for Space Studies, where he was seconded by two dynamic general managers, Yves Sillard and Frederic d'Allest. He then proved himself an indefatigable negotiator, as minister, during discussions in Rome in January, 1985, to outline Europe's space policy for the next 15 years.

Seven years have gone by since that interministerial conference, where Europeans "made ambitious decisions without really commiting themselves financially." Now Mr. Curien is returning to space affairs—with great pleasure. "Since Mr. Paul Quiles has become minister of the interior and public safety and left the technical ministry where he was responsible for space, space is being transferred back to a technical ministry, the Ministry of Research. President Mitterrand was kind enough to remember my interest in the topic."

All of the research minister's past experience and knowledge of the issues, even after a four-year hiatus, will be needed to settle the problems of Europe's space program. The next year will not be an easy one. For although space was long a showcase for what efficient European collaboration could accomplish, politicians—who have other urgent matters to attend to—take a dimmer view of it today, despite continuing public support.

The reasons for this are many. The end of the pioneer era, when spectacular feats such as the conquest of the moon still played to a full house, is one. More important is the fact that space ventures are becoming more ordinary and, like any other industrial activity, are feeling the effects of the budget crunch that is sweeping across Europe. This was illustrated perfectly by the last interministerial conference in Munich in November, 1991. Paul Quiles, who was space minister in the Rocard and Cresson governments, spent lavishly on it.

A 60-Percent Increase in Five Years

Far from deciding to launch big, ambitious programs such as the manned station Columbus or the Hermes space plane and finance them over a period of several years, the European ministers squeezed the budgets into "snippets" and approved funds for one year only, at the expense of the French. Thus, although the interministerial conference was a partial failure, it did have one positive outcome: Despite the anguish, the politicians had avoided a breakup.

It was a bitter pill to swallow. Inklings of it were already apparent, though unstated, in the budget difficulties of a Germany battered by the cost of reunification. When the second-largest financier of Europe's space program sneezes, the rest of Europe gets a cold. Not all the member states of the European Space Agency are as lucky as France. Under the reign of Mr. Quiles, France's space budget has grown by nearly 60 percent over the last five years: It was 5,491 million French francs [Fr] in 1988, Fr6,453 million in 1989, Fr7,167 million in 1990, Fr7,929 million in 1991, and Fr8,553 in 1992.

This manna certainly helped underwrite a number of programs, including the development of the heavy Ariane-5 launcher, continued manned flights with the Soviets—the latest of which is expected to be the Franco-Russian Antares mission at the end of July—the first phase of construction of the Spot-4 and ERS-2 observation satellites, and the start of programs for the high-speed-transmission DRS satellites. But the next few years promise to be difficult.

The challenge does not faze Mr. Curien. "What makes me optimistic," he said, "is that last week, during a conference in Munich on International Space Year, Europe's space program seemed to regain some coherence and dynamism. It seems to me that everyone is ready to define European space policy clearly, taking into account the new situations in Russia and the United States. What will become of the former Soviet Union's space infrastructure? What will the policy of NASA and its new administrator be?"

All are areas that will have to be monitored closely so that Europe can define something coherent in unison.

The coming year is "crucial," and European space officials will be working at a steady clip in the few months that remain to prepare the interministerial space conference that will be held at the end of the year in Spain. Though the ministers seem determined to maintain Europe's presence in space, they are less clear about how to achieve that goal, given the financial constraints under which they are working.

One thing is sure: The Europeans will take another good, hard look at the content and timetable of the Hermes and Columbus programs before the Spain meeting, and perhaps scale back their ambitions. And the research minister may eventually wonder about France's national space organizations (General Space Delegation, Space Committee, and the National Center for Space Studies) and the way they are intertwined, to be sure that he has "strong and open national organizations" for the end-of-year negotiations.

Such strength is all the more important as, according to Mr. Curien, "we are going to have to take a very close look at European space activities, without deluding ourselves. It would be ill-advised to decide on a package of programs without being sure of our ability to properly fund them. But," he adds, "let's not forget that, beyond the financial problems, the important thing is to know what we want to do and can do together."

French Research Minister Favors Ambitious Space Policy

92WS0544B Paris AFP SCIENCE in French 23 Apr 92 pp 7, 8

[Unattributed article: "Mr. Curien on Space Policy: Continuity, Realism, But Also Ambition"]

[Text] Paris—On 22 April, at the session of questions to the government, Mr. Hubert Curien, minister of research and space, declared himself in favor of a European space policy marked by "continuity, realism, but also ambition."

Answering a deputy's remark that "it was not possible to finance everything in space," the minister pointed out that, when it comes to space, we should distinguish between launchers (Ariane), the exploration of the Cosmos, the management of the planet Earth, and manned support structures (Freedom and Hermes).

Concerning the success of European launchers, "which assures us more than one-half of the world market for launching services, it is undeniable that we should continue in this way, and that is possible," Mr. Curien pointed out, expressing his views on space for the first time since he was put back in charge of space in the government.

"Everybody in Europe agrees" to continue the exploration of the Cosmos, a field where Europe is well placed, Mr. Curien went on. As for managing the planet Earth, "on that, too, everybody agrees, including increasing resources. As for us, the French, we have developed and launched the Spot Earth-observation satellites and made a large contribution to the European ERS-1 satellite."

"Then, we have more difficult matters," the minister acknowledged: support structures enabling astronauts to live in space, such as the international (but mostly U.S.) space station Freedom, and the Hermes spacecraft. In 1985, we outlined a program that was adopted in 1987, and confirmed in Munich in 1991.

We must continue negotiations, the minister added. An important date is that of the new European space conference, scheduled for November, in Spain. "Among us, European space ministers, we must define a schedule and programs for the next 10 years. The political landscape has changed, as well as the financial capabilities of some of us in Europe. We must reconsider the whole thing in this context. From the French point of view, we shall study the entire question by then, based on Mr. Leridan's excellent report (...). I wish for the policy that we shall adopt" (in November) "to be marked by continuity, realism, but also to be ambitious."

AUTOMOTIVE INDUSTRY

Greece's Elbo, France's Rhone-Poulenc Chimie Develop Catalyzer

92WS0438B Paris INDUSTRIES ET TECHNIQUES in French No 721, 28 Feb 92 p 37

[Article by Andre Larane: "A Dust Filter for Diesel Motors"; first paragraph is INDUSTRIES ET TECHNIQUES introduction]

[Text] A weapon in the war against urban pollution is being tested in Athens. The Greek manufacturer Elbo, together with Rhone-Poulenc Chimie, is offering a particulate trap that can be installed on the muffler of vehicles.

Initial conclusive results: Dirty and malodorous, the diesel motor has a bad reputation. Is the solution to this problem a clean motor, as the manufacturers of trucks and buses assert, or a particulate filter, or a combination of both? The forthcoming stiffening of the legislation leans toward the third of these solutions.

This, at least, is what Rhone-Poulenc Chimie's management thinks. It is engaged, together with Elbo, a Greek industrial enterprise, in the development of a particulate trap. Elbo had worked on a system that included ceramic filters supplied by Corning (United States) and NGK (Japan). Initial tests showed the need of an additive in the fuel to regenerate the filter. With no additive, the filter clogged in a few hours. This brought France's Rhone-Poulenc Chimie into the action. The French manufacturer had been working on an organic salt of cerium, and saw in the Greek innovation an outlet for its product, which is manufactured from rare earth metals. When the additive reaches the combustion chamber, it

burns, yielding cerium oxide, which mixes homogeneously with soot particles and forms a catalyzer of the burning process. The burning of the soot takes place between 450-480°C instead of around 600°C, thus making it unnecessary to use a specific burner as do the other types of particulate traps.

The cerium residues accumulate in the filter in the form of oxide, requiring that the filter be cleaned every 100,000 km. The addition of cerium, at the rate of 0.1 to 0.5 gram per liter of fuel, provides continuous regeneration of the filter throughout 98 percent of the motor's operating time. The remaining 2 percent is used to carry out an assisted regeneration in accordance with the method conceived by Elbo: A brake is applied to the motor so as to heat the exhaust gases sufficiently to burn the particulates.

The combination of the filter and the additive has been tested successfully by 110 buses in Athens over a cumulative total distance of 10 million kilometers. Generalized use of the filter would reduce Athens's particulate pollution by half. Following the Athens tests, Rhone-Poulenc and Corning tested their trap in Seoul.

"Elbo's trap has the advantage of being simple to install, in two hours, on an old bus. And its maintenance poses no difficulties," says Jacques Lemaire, manager of the project at Rhone-Poulenc Chimie. These reasons would seemingly tend to favor its installation on bus fleets in the industrial developing countries. What is more, "it entails no increase in fuel consumption," says Jacques Lemaire, "and as for the additive, it increases the cost of the fuel by 2 percent." The unit price of the device is not very high, around 30,000 francs [Fr] in lots of several tens. That is around 3 percent of the cost of a new bus. And it could drop rapidly: Dae Sung, a Korean licensee, plans to commercialize mass-produced filters at a price of Fr15,000 (including installation)!

Jacques Lemaire dreams of a demand for the particulate trap in Mexico and in the major South American cities. To say nothing of the United States, where the old buses will have to be renewed by 1996 at the latest. In France, he is preparing to test the trap on a bus in Lyons. Philippe Chartier, scientific director of the Environmental and Energy Management Agency, is encouraging these efforts. "The diesel is an environmental solution in the area of transportation. It contributes very little to the greenhouse effect and provides an outlet for petroleum by-products," he points out. "No matter what you do, alternative fuels will never represent more than a very small proportion of total consumption." The transport operators and manufacturers, for their part, would prefer to go for a clean motor and electronic regulation. Several disappointments and the fear of operating cost increases lead them to oppose the particulate traps approach.

The RATP [Independent Parisian Transportation Board] has decided not to invest in this approach. Two years ago, it equipped a bus of the former generation (a Renault Industrial Vehicles SC 10) with a Webasto thermal-regeneration type filter. The test resulted in fuel cost increase of approximately 8 percent. Mercedes has equipped some 1,500 of the buses it manufactures with a particulate trap of its own design. But it has discontinued this approach because of the system's shortcomings, and prefers to place its hopes on electronic regulation. Most of the other European manufacturers, Renault Industrial Vehicles foremost among them, have now opted for the same choice.

BIOTECHNOLOGY

Belgian Company Develops Method for Genetically Engineering Corn

92BR0329 Groot-Bijgaarden DE STANDAARD in Dutch 15 Apr 92 p 15

[Article by Hilde Van Den Eynde: "Emasculation of Corn Easier and Cheaper; Plant Genetic Systems Develops Technique for Genetic Manipulation of Cereals"]

[Text] Ghent—Once again, Plant Genetic Systems [PGS] from Ghent is one step ahead of its competitors. This time, the company developed a convenient and fast way to manipulate corn, a technique which biotechnologists had been trying to find for many years. The technique should allow, among other things, to produce high-grade corn seeds, for which there is a great demand from seed companies. Jan Leemans, research manager at Plant Genetic Systems, today unveiled the brand-new technique to fellow researchers at a symposium organized high up in the Rocky Mountains (I always suffer from altitude sickness there, he complains), in the American ski resort of Keystone.

For a long time, it seemed that corn manipulation presented insurmountable problems to biotechnologists. They did succeed in giving bilobed plants (such as tomatoes and cauliflower) genetically engineered extraneous properties, which made the plants resistant to pestilent insects or viral diseases or to frequently used pesticides. However, their monocotyledonous counterparts, such as corn and rice, were more difficult to manipulate.

There had been several attempts which occasionally produced minor successes, but a convenient and fast way to impregnate bilobed plants with additional (hereditary) properties was never found. PGS has now found a way, at least as far as corn is concerned. A team headed by Kathleen D'Halluin, an agricultural engineer who worked for a seed company for quite some time, has developed a (surprisingly simple) technique.

D'Halluin uses immature, approximately 10-day-old corn embryos which were removed from a pollinated corncob. These tiny little plants are exposed to an enzyme for a minute or two ("something pectinase-like," said Leemans, who refused to elaborate on the subject). The enzyme nibbles small particles from the otherwise

impenetrable cell wall, making it possible to impregnate the cell with foreign DNA (hereditary material called "genes"). The techniques developed by PGS' competitors require the removal of the entire cell wall, which often makes it impossible to breed modified cells later on.

Field Tests

Impregnation with foreign genes is achieved through a well-known technique called electroporation: The embryos are put in a solution, which is subjected to an electrical current. The latter ensures the embryo's impregnation with foreign hereditary material.

The treated plants are then deposited on culture plates on which they germinate after approximately six weeks. They form roots and leaves very fast ("they outgrow the pot within a week", says Leemans), and two or three weeks later they can be planted in greenhouses. "All in all, the whole process takes three months at the most," says Leemans.

PGS has monitored four generations of its manipulated corn plants and so far everything is looking normal. Genes which were transferred using the new technique are still present in all subsequent generations. Says Leemans: "Last year, we already conducted field tests with plants which, by way of trial, were injected with a gene to make them herbicide-resistant.

A major advantage of the PGS technique is that the new genetic material is contained in all of the plant's cells. "So far, we have not found a single chimeric plant," says Leemans. Competitive techniques have often had to cope with the problem of chimeric plants (in which the foreign material is absorbed by some, but not by all of the cells). These plants, for instance, do not transfer the new genes to their offsprings (and of course, this is what it is all about).

Another advantage of the PGS technique is that it is applicable to a great variety of plant species, another aspect where other techniques tend to fail. The "particle gun," for instance, which blasts foreign DNA into plant cells, is as yet only applicable to economically insignificant corn species. The PGS-developed method is also suitable for economically more important varieties. This explains why Jan Leemans beams with self-confidence. "By the end of the year, everyone will be applying our method," he says.

Seed Production

PGS uses the technique to impregnate plants with a DNA fragment which prevents them from producing pollen. This is an indispensable step toward the production of high-quality seeds. The fragment (a sort of suicide squad) sees to it that a specific cell layer of the stamen (the tapetum) does not develop. This cell layer is needed for the development of pollen grains, so if it is removed, the (otherwise normal) corn plant produces sterile tassels.

Such plants in which only the female reproductive system functions are indispensable for the production of superior corn seed. In technical terminology, this is called hybrid seed, which is produced by crossing two different corn species. It yields a bigger crop and is more resistant to diseases.

To produce hybrid seeds, pollen from parent plant A must reach the pistil of parent plant B. This is not obvious, because in corn plants, pistils and stamens are on the same plant. This encourages self-pollination, which is not propitious to the production of superior seeds. This is why seed companies are compelled to systematically "emasculate" their B-plants.

To this day, this is done partly mechanically and partly manually. In the case of corn, the farmer overflies the corn field and removes the top sections of the corn plants (the male reproductive organ is on top of the plant, the female organ at the bottom). As a rule, the helicopter has to overfly each field three times, which is sometimes impossible due to bad weather conditions.

Once the helicopter is gone, job students are sent into the fields to finish the job. They manually remove the corn tassels missed by the helicopter, or the ones which sprang up after the flight. "Every year, some 45,000 job students are hired in the United States," says Leemans. "The cost of this seasonal work amounts to $180 million. With our system of gen-technological emasculation, these costs can substantially be reduced."

At the same time, of course, the company will also make big profits, because hybrid seed production is a gold mine for the seed sector. Every year, new hybrid seeds must be produced from scratch (seeds produced by hybrid seedlings lose their superior qualities).

"Hybrid seeds account for all the profits made in the seed industry," says Leemans. PGS has already successfully applied its technique of gen-technological emasculation to tobacco, colza, Belgian endive, broccoli, cauliflower, lettuce, cotton, and tomatoes. Corn is the first monocotyledonous plant to be manipulated. "Corn represents some $3 billion in the seed market," says Leemans. "For PGS, it would be interesting to get its piece of the pie."

Besides corn, PGS also wants to use the new technique to make wheat and rice male-sterile. The flowers of these plants are so small, that mechanical or manual emasculation is not possible. Gen-technological removal of their pollen would open up an even larger market than was the case for corn. Ever since last year, PGS has been working very hard to adjust the corn manipulation technique to rice. To this end, it is cooperating with one of its shareholders, Japan Tobacco, whose interest in the project is dictated primarily by its geographical location.

Ready for the Market

This very summer, PGS will field-test its pollenless corn "in Belgium, France, and the United States," says Leemans. The company's goal is to have hybrid corn seed on the market by the second half of this decade.

In the future, the production of hybrid seeds will account for half of PGS's commercial activities. For its production of hybrid Belgian endives, PGS has already carried out extensive field tests which produced good results. PGS is not afraid of competitors. "They have only recently managed to produce their first Belgian endive hybrids," says Leemans, "using a terribly complicated technique."

PGS has scheduled more field-tests for Belgian endive, which should be completed within two or three years. For most vegetables, PGS intends to license its technology per species and per market. "The vegetable market is too fragmented for us to start producing seeds ourselves," explains Leemans.

The situation is quite different for colza. For this plant, which produces oil with a favorable fatty acid composition, no hybrids exist so far. PGS therefore considers it "strategically expedient" not to leave this business to others, but to produce the hybrid seed itself. It will not be on the market until 1996, says Leemans, but definitely before the end of the century.

Later this summer, PGS will publish its corn manipulation technique in the magazine, THE PLANT CELL. Bob Goldberg, one of Leemans' colleagues who helped him develop the hybrid seed production system, works as a free-lance editor for this magazine. "I have a hunch that our contribution will be accepted," says Leemans jokingly.

French Researchers Succeed in First Mammalian Gene Substitution

92WS0514B Paris LE MONDE in French 19-20 Apr 92 p 8

[Article by Catherine Vincent: "The Pasteur Institute Makes the First Functional Substitution of Genes in a Mammal"; first paragraph is LE MONDE introduction]

[Text] By replacing one gene with another in embryonic cells, a Pasteur Institute team has for the first time produced mutant mice whose morphology was altered during embryogenesis. The team's results were published in the latest issues of the reviews CELL (17 April) and MEDICINE/SCIENCES (April, 1992). They are based on two recently developed techniques that open up new possibilities for research on embryonic development and our understanding of human hereditary diseases.

How does a clump of undifferentiated cells, produced by the successive divisions of a fertilized egg, organize itself to become a budding embryo consisting of a head, a thorax, and a spine? We now know that a highly specific group of genes play a part in this metamorphosis—one of the most mysterious in biology—by determining the cells' future depending on their location in the embryo. Scientists discovered these "homogenes" in the drosophila fly in the late seventies, but they exist in all mammals as well. To date, 60 of them have been identified in mice, and the list is probably not complete. For the most part, however, we still do not know how they function, or what developmental anomalies may be caused by their disorder.

The work of the Pasteur Institute team focused on one of these mice homogenes, called Hox-3 1. Researchers Philippe Brulet, Herve Le Mouellic, and Yvan Lallemend [1] based their work on two recent techniques which, combined, should become a prime tool for transferring animal or human genes.

"Random" Grafts

The first technique has been tested on mice for several years and involves working on embryonic stem (ES) cells. ES cells are removed at a very early stage of embryogenesis and are not yet specialized, which means that a foreign gene can be grafted onto them if they are grown in the laboratory. Once they are reinserted into an embryo, they resume their normal course of development.

The second technique, dubbed homologous genetic recombination, enables researchers to very precisely "graft" the foreign gene they wish to study onto the chromosomes. Indeed, for a long time most genes that were transferred to mammal embryos (mice, cows, sheep) were introduced "at random," substantially reducing yield.

Homologous recombination is delicate and complex but molecular biologists are steadily increasing their mastery of it. The technique now enables them to control how many gene copies are introduced into a cell and to plan where the copies will be incorporated. Biologists can thus insert a given gene into a precise spot on the target genome, without risking undesirable modifications in other genes.

The French researchers used homologous recombination to produce mice in which the Hox-3 1 gene had been replaced by a "marker" gene (a gene that does not affect the embryo's development but allows researchers to locate cells containing it). "All the mutant mice suffer from an anomaly of certain vertebrae, which changed to take on the appearance of vertebrae lower down," sums up Herve Le Mouellic. The loss of the Hox-3 1 gene thus altered the development of an entire embryonic region, "by modifying not the position, but the identity of the cells that should have expressed the homogene."

This research is of fundamental interest to embryologists, and could open up enormous opportunities in biomedical research. Indeed, this very specific technique of gene substitution allows scientists to assess the role of a gene under real physiological conditions. It should consequently speed up the development of animal

models of human hereditary diseases or diseases with genetic effects. Such models to help us understand the etiology of many serious illnesses are still cruelly lacking.

Footnotes

1. Cellular Genetics Unit of the Paris Pasteur Institute (associated with the National Center for Scientific Research, URA 1148).

Finland: New Biotechnology Centers Under Development

92WS0523A Helsinki HELSINGIN SANOMAT in Finnish 26 Apr 92 p B8

[Article by Marja Salmela: "Biobusiness Springing Up in New Centers; Medopolic in Oulu and Biocity in Turku To Open Early This Summer, Tampere and Kuopio To Follow Them"]

[Text] Oulu (HS)—A network of technology centers specializing in biotechnology and medical technology is being created in Finland. The first nodes are nearing completion in Oulu and Turku. Medipolis in Oulu and Biocity in Turku will open their doors between May and June.

Tampere and Kuiopio are to be the next cities to get into the bio-business. Construction of Finn-Medi is to begin this summer in Tampere and Bioteknia next winter in Kuopio. Both will be completed by 1994.

Only the capital is missing from the network. We will have to wait for years yet for the science park in Viikki because the city of Helsinki and the state cannot reach agreement on the price of the complex and on construction costs.

The biotechnology centers are now at the same point as the technology villages specializing in electronics and computer technology were a scant decade ago. The country's university towns competed with one another then to see which of them could grow out of its own village first most vigorously and the fastest .

Oulu and Turku have succeeded in pushing their way to the top in the race between bio-business technology centers because they had lots of experience in running their own technology villages. Since the cities and universities operate in unison both projects could be kick-started before the recession set in.

Oulu residents founded a real estate company, which itself built Medipoli, costing slightly more than 70 million markkaa.

The company has a share issue in progress at the present time. The capital stock will be raised to 30 million markkaa. State subsidies were not used in Oulu.

State Subsidizes by Buying Facilities

Turku residents persuaded the YIT construction company, which built Biocity, costing 350 million markkaa, to join the venture. The state subsidized the venture by buying the facilities for the technology institutes for 170 million markkaa. The remainder will be sold or leased to private companies.

Finn-Medi in Tampere is being created following the Turku model. YIT will serve as the builder, the city of Tampere is financing the venture, and the state is buying accommodations for the medical faculty in a building costing nearly 200 million markkaa.

The VTT [State Technical Research Center] Hospital Technology Laboratory as well as the Institute of Technology's Hospital Technology Institute will become the leg on which Finn-Medi stands.

In Kuopio the state and the city will be joining the venture. The A.I. Virtanen Institute, for which the state is buying accommodations for 45 million markkaa, will be installed in Bioteknia, which will cost about 75 million markkaa. As for the city, it will locate its food laboratory in its own building.

"The institute will take up half of the space and sustain the whole venture. A third of it will be left to private firms," Bioteknia developer Veli Matti Nokso-Koivisto, the managing director of the Kuopio Technology Center, said.

Umbilical Cord to Hospital

There is no sign of the recession in Oulu and Turku's new biotechnology palaces. The sun shines on the glass-covered main streets, the trees are green, and the sculptures formed by the water ripple. While hundreds of new office buildings stand vacant, Medipolis and Biocity are attracting businesses.

The fact that the country's second-largest university hospital is within range of the men in white jackets [scientists, researchers] is an asset for Oulu. Like an umbilical cord, a glass corridor links Medipolis with the university central hospital, out of whose staff's know-how Medipolis plans to absorb the vital energy for its new business.

"It will now be easy for the doctors to convert the results of their research into products since there is a business breeder in readiness at the neighbor's place and Medipolis Link, which rents out equipment and sells laboratory services," managing director Matti Olsen said.

Pharmaceuticals plants and firms specializing in hospital technology need the assistance of the hospital when they test new drugs and procedures. They do not need to invest in their own facilities or laboratories.

Biocity will attract businesses because hundreds of researchers and students will be working there under the same roof. The bioscience institutes and some of the medical institutes of the University of Turku and Abo Academy will be getting new quarters in Biocity. The institutes will in any case combine forces and form a new biotechnology research center.

"Companies will find well-trained people here who have international contacts. Knowledge of the new technologies developed in the outside world and the results of research will quickly spread to firms," the head of the Biotechnology Research Center, Dr. Markku Jalkanen, explained.

Will There Be Too Many Centers?

How many biobusiness centers can survive in Finland?

Some experts suspect that even four centers are too many in a small country. Others, on the other hand, firmly believe in a triumphal march of biobusinesses in the 1990s.

"Success will be completely based on top-of-the-world breakthroughs by university research teams. Applications can be developed from new insights and companies can be founded. Unique products will also attract big foreign firms to Finland like a magnet," said Oulu biocenter science director Prof. Karl Tryggvason. Biocenter is the cooperative organ of Oulu scientists. In the opinion of Paula Nybergh, the head of the Technology Development Center (TEKES) biotechnology project, Finnish research is at present producing high-level results because the Education Ministry, the Academy of Finland, and TEKES purposefully invested in basic research in this field in the 1980s.

"If Oulu, Turku, Tampere, and Kuopio specialize, there will be enough Lebensraum for each of them," Nybergh thinks.

"They should under no circumstances compete with one another. The right partners in competition will be found in other countries."

Successful Products by the Milliliter

Biotechnology and biomedicine are like a horn of plenty. Finns too now have an abundance of know-how and already developed products. The scientists' horn has produced biobleached cellulose, alcohol-free beer, diagnostic methods based on animal cells, laboratory work stations, micropropagation techniques, etc.

The scientists have set their sights on even more colossal products. Biodegradable bags that will replace plastic bags are easily developed from sugar beets. Waste-eating bacteria will be employed to clean up the environment. Present-day production processes will be shortened with the aid of enzymes and they will be transformed into more environment-friendly processes.

Many Finnish research teams have achieved many international breakthroughs in biomedicine. Internationally important applications of them are expected that may in future be produced at the new biotechnology centers.

Oulu Prof. Kari Kivirikko's research on collagens is producing a new drug for cirrhosis of the liver, development of which a German pharmaceuticals giant is interested in. Karl Tryggvason's team is developing a new diagnostic technique for the detection of hereditary kidney disease.

Kuopio brain researcher Paavo Riekkinen's research is producing a drug that improves memory and the ability to concentrate. New tests for the identification of cancer-causing viruses are already being produced by cancer researcher Kari Syrjanen's team.

Markku Jalkanen of the Turku team has set its sights on a drug by means of which cancer-cell activity could be transformed back into normal activity. Prof. Antti Yli-Urpo is developing biomaterials, like bioglass.

Prof. Pertti Tormala of Tampere is also developing biomaterials, for example, bone nails that dissolve in the organs of the body.

"The distance between basic research and its applications is relatively short in biotechnology. Biobusiness will get by if it invents special products that are produced in very small quantities, even only milliliters. These will be easy to transport to the other side of the world, and good prices can be gotten for them," project head Paula Nybergh of TEKES said.

France: CEA, CNRS Create Biological Research Institute

92WS0544C Paris AFP SCIENCE in French 23 Apr 92 pp 27, 28

[Unattributed article: "Structural Biology Institute of Grenoble, To Study the Intimate Structure of Cells"]

[Text] Paris—The Structural Biology Institute (IBS) of Grenoble—the organization and operation of which are defined in an agreement signed on 22 April by the Atomic Energy Commission (CEA) and the CNRS [National Center for Scientific Research]—will make it possible to merge and better manage the two largest French research centers' biological research programs: Proteine 2000 and Imabio [Biological Macromolecule Engineering].

The agreement was signed at the CEA headquarters by Messrs. Philippe Rouvillois, CEA director, and Francois Kourilsky, CNRS general director; it confirms the determination of both organizations to work together in basic and applied research fields that will have a major impact on pharmaceuticals, agrifood, chemicals, electronics, and of course protein engineering, all sectors with considerable economic prospects.

A thorough knowledge—down to atomic level—of the way cells and molecules work, will yield an understanding of the most subtle mechanisms of life itself, and

its relations with the environment, both outside and within the body, thus making it possible to make the most of its complexity.

The object of the IBS, whose director is Mr. Jean-Pierre Ebel, is threefold: to develop leading-edge methods; to apply them to solve biological problems; and to train young structural biologists.

Set up on the Grenoble scientific polygon, the IBS will benefit from being close to the Nuclear Research Center of the CEA and its Cray-2 computer, and to the neutron source of the Laue-Langevin Institute high-flux neutron reactor; in addition, its researchers will be able to use the light lines of the European synchrotron (ESRF [European Synchrotron Radiation Facility]), especially for all their crystallographic research. Thus benefiting from the very dense scientific environment of the Rhone-Alps region, the IBS will be widely open to French and European researchers.

Proteins, the building blocks of life that are present throughout the organism, play a vital role in all biological processes that characterize living organisms.

Playing a part in the expression as well as the control of hereditary characteristics, they catalyze and regulate all the reactions that take place in cells, at enzyme level and in the way muscles work, in carrying oxygen to the blood, in immune defenses (antibodies), in carrying and storing nutritious intakes. They are also involved in the transmission of information and regulation signals (hormone receptors), and in the emission and reception of the chemical transmitters of nerve impulses.

The most sophisticated investigation methods—crystallogenesis, crystallography, nuclear magnetic resonance (NMR), graphic modeling, protein chemistry, mass spectroscopy, structural electronic microscopy—will be available to the 200 or so researchers that will constitute the IBS full staff. Ninety are already on site.

The IBS budget has not been set yet; however, we already know that the CNRS chemical sciences department has a 1992 budget of 305 million francs [Fr], and that the budget of the CEA life sciences directorate amounts to Fr320 million.

French Laboratory, CEA Sign Biotechnology Accord

92WS0555B Paris BIO: LA LETTRE DES BIOTECHNOLOGIES in French 5 Apr 92 p 3

[Article entitled: "Pierre Fabre Laboratories Signs an Agreement with the CEA"]

[Text] The second-largest independent French laboratory, Pierre Fabre (Castres), is prioritizing research to double its size in five years, something it must do to insure its survival.

For the last three years, the 5,500-employee group has essentially pursued external growth. It has acquired one after another Rhobapharm in Switzerland, Lineafar in Portugal, Physicians Formula in the United States, Ellem in Italy, Lajaunie's cachous, and, just recently, a Rhone-Poulenc plant in Gien. Consequently the group's turnover, which had already jumped from 3.6 to 4.1 billion French francs [Fr] in 1991, should climb to Fr5 billion this year. Seventy percent will derive from pharmaceutical and 30 percent from cosmetics sales. To continue expanding, the second-largest French laboratory after the Servier group is now emphasizing internal growth.

Among other measures, it has announced the signature of a skeleton agreement with the Atomic Energy Commission that should enable it to beef up its research. "Our top objective now is to discover and develop new medications," say officials at the group's headquarters. "Over the last two years we have totally restructured our research departments by installing a new center in Labege near Toulouse." Pierre Fabre is preparing to work with the CEA on anticancer medicines and synthetic vaccines, "but we may collaborate in many other areas," say officials at Pierre Fabre, which has already concluded agreements of the same type with the National Center for Scientific Research (CNRS) and the National Health and Medical Research Institute (INSERM). In addition, a science coordinating committee that sits three representatives from each partner will be established. The research programs of the CEA's life sciences directorate focus on protein engineering, the ecophysiology of vegetation, immunology, radiobiology, and in vitro functional imaging—fields in which a synergism with Pierre Fabre Laboratories could develop.

European Pharmaceutical Firms Produce, Market Antitrypsin From Transgenic Ewe

92WS0555C Paris BIO: LA LETTRE DES BIOTECHNOLOGIES in French 5 Apr 92 p 3-4

[Article entitled: "Bayer Snags Exclusive Rights to the Milk Production of a Transgenic Ewe"]

[Text] The German group Bayer paid £10 million for the exclusive rights to produce milk from a Scottish transgenic ewe and its descendents. An Edinborough company named Pharmaceuticals Proteins performed the gene manipulation that enables the ewe, Tracy, to make antitrypsin, a human protein whose deficiency results in liver disorders. Until now, the only way to obtain antitrypsin had been to extract it from blood plasma, with the usual problems of collection, quantity, availability, and safety. The number of patients affected in the United States and Europe is about 100,000. Each liter of Tracy's milk contains 35 grams of antitrypsin, so 3,000 transgenic ewes should be enough to produce the required quantity. The Scottish company, stresses President Ron James, is responsible for production, and Bayer for purification, clinical testing, and international distribution.

France is not far behind in the development of transgenic animals. The National Agronomic Research Institute (INRA), in a team effort with Strasbourg's Transgene, has created a rabbit that also produces antitrypsin, in its blood. Moreover, INRA is working on nanny-goats and female rabbits that express foreign proteins in their milk. At the University of Leiden in the Netherlands, a cow is producing lactoferin, an antibiotic that is naturally present in women's milk and for which an obvious application is baby food. An American she-goat is producing human hemoglobin TPA and a pig human hemoglobin DNX (Princeton, New Jersey). The firm says advantages include the possibility of producing enormous quantities without risk of transmitting hepatitis B or AIDS, which the animals do not carry. Clinical tests are scheduled for 1993 at the earliest. Compared to transgenic animals, the drawback of bacteria, mushrooms, and yeasts is for long and costly extraction required from complex media produced by fermenters.

French Researchers Developing Biological Pesticides to Eradicate Tropical Disease Vectors

92WS0555D Paris BIO: LA LETTRE DES BIOTECHNOLOGIES in French 5 Apr 92 p 7

[Article entitled: "Biopesticides to Eradicate Mosquitoes"]

[Text] A Bureau of Overseas Scientific and Technical Research (ORSTOM) team led by Jean Marc Hougard and working at the Yaounde Pasteur Center in Cameroon conducted a large-scale mosquito-eradication campaign from 24 February to 20 March 1992 The researchers used a biological pesticide called *Bacillus sphericus*. It was the first time such a campaign had been conducted on a city-wide scale, the city in question being Maroua, an urban center of nearly 150,000 inhabitants in northern Cameroon. The team applied the biopesticide to all the egg-clutch sites of the principal urban mosquito, *Culex quinquefasciatus*. The bacteria's spores contain a toxin that kills the mosquito's larvae after ingestion. Substantial logistical support made it possible to complete the project, which was supported and partially financed by the World Health Organization's Tropical Disease Research program, in just one attempt. Ten motorized teams, or 50 people, participated in the campaign, which took place during the dry season two months before the first heavy rains could dilute and wash away the pesticide.

The researchers expect the mosquito to be virtually eradicated from the treated sites. However, there is a strong chance that it will reappear, due to overlooked or new beds, reinfestations from nearby towns, etc. In that case, researchers will study and measure the causes and speed with which the mosquito repopulates Maroua, to assess the effectiveness of large-scale treatment and determine how the biological pesticide should be sprayed. Initial results are expected at the start of the rainy season next July, when the mosquito population is ordinarily quite large.

Mosquitos periodically constitute a veritable scourge in Africa and many other regions of the globe. Certain species such as the *Anopheles* transmit the parasite for malaria, which infects about 270 million people. Others such as *Culex* or the *Mansonias* are vectors for lymphatic filariasises (about 80 million people affected). Mosquitoes can also be a nuisance in themselves, just by the number of bites they inflict: In Maroua, one individual can be bitten over 300 times a night during certain periods of the year.

Biological pesticides offer new opportunities—environmentally safer than those afforded by chemical pesticides—to combat tropical disease vectors. To date, two micro-organisms have proved to be especially useful and environmentally safe: *B. sphericus* and *Bacillus thuringiensis*. The latter, which is already functional, has been put to use as an anti-simulium larvicide in the program to combat onchocerciasis in West Africa. When employed in rotation with chemical larvicides, it has successfully delayed and countered simulium resistance to the insecticides. *B. sphericus* is on the verge of becoming the larvicide for polluted water—seriously rivaling chemical insecticides, which pollute and are losing their effectiveness due to acquired resistance. The results of such experiments and the possibilities offered by genetic manipulation offer new hope. Introducing the genes that enable the *Bacilli* to produce larvicide toxins into other organisms such as algae may extend the micro-organisms' scope of action, increase their toxicity, and improve their remanence.

French Biomolecular Genetics Commission To Approve Transgenic Plants

92WS0555E Paris LE MONDE in French 29 Apr 92 p 10

[Article by Catherine Vincent: "First Genetic Plants To Be Approved Soon"; first paragraph is LE MONDE introduction]

[Text] The Biomolecular Engineering Commission is responsible for controlling the risks related to the production of plants and animals that have been genetically altered for agricultural or food-processing purposes. It has been since 1986, when it was given the job by the Ministry of Agriculture. Last week the Commission submitted a report of its activities during 1991. According to its president, Mr. Axel Kahn, "many projects are nearly ready to move into the approval phase that is one step away from their entering the market."

More and more genetically modified organisms (GMO), whether cultivated plants, vaccines, or bacteria of interest to the food-processing industry, are leaving the laboratory behind as they come closer to gaining marketing approval. Transgenic plants are plants into which technicians have introduced a foreign gene to alter their characteristics. Nearly 400 open field experiments have been conducted on them worldwide since 1987,

including 230 in the United States and over 100 in France. Many of those trials now concern economically important plants of interest to the food industry, which will ultimately be disseminated in nature.

Thirty of the 32 experimentation requests that the Biomolecular Engineering Commission examined in 1991 involved transgenic plants: seven for colza, five for corn, five for beets, and three for potatoes. The number of requests remained virtually stable, since 30 were reported in 1990. In about half the cases, the goal of the requesting manufacturer was to make the plant genetically resistant to an herbicide. Others sought to make the manipulated plants resistant to insects or specific illnesses (the rhizomania virus for beets, tinea for potatoes) or to improve their nutritive value (colza).

Millions of Hectares

"Compared to previous years, the cases submitted to us in 1991 suggest that 1992-1993 will be a watershed year," said Mr. Axel Kahn, the Commission's president, on Tuesday, 21 April. According to him, "many projects that have been monitored for years are nearly ready to move into the approval phase that is one step away from their entering the market." This fact underscores the importance of the recommendations made by the Commission, which is responsible for insuring that biotechnological products are designed "to strictly respect the safety of consumers and the population."

The Commission approved only 21 of the 31 cases it examined in 1991 under the experimental conditions submitted. In 10 other cases, the manufacturers had to revise their plan to secure authorization to conduct open field trials. In particular, they had to describe in greater detail the genetic blueprint used in their protocol, information that the Commission deems "vital to analyzing the recombined organism's characteristics."

"Up until now, transgenic plants were tested only on small plots, under highly rigorous control," pointed out Mr. Kahn. "In the future, they will probably be planted on millions of hectares and treated like any other crop, without special isolation or confinement." Consequently, the genetically engineered modifications "in the genome, proteins, and behavior of the new varieties must be spelled out perfectly."

However, researchers themselves recognize that, whatever precautions they take, large-scale cultivation of transgenic plants will probably have some unexpected consequences, to which agronomists and farmers will gradually have to adapt. What kinds of agricultural practices, for instance, will have to be adopted for plants that have been made spontaneously resistant to herbicides? What kinds of new viruses will emerge from crops made resistant to viral illnesses? These are questions that scientists cannot answer today, but whose importance must be assessed through experiments in open fields.

The existence of the Biomolecular Engineering Commission makes France one of the rare European countries to have a real system of control and evaluation. And legislation is pending that would shore up its role. The Senate is now discussing the bill on "controlling the use of genetically modified organisms" that Messrs. Curien and Lalonde, at that time the minister of research and the minister of the environment, presented last October.

The bill aims to bring French legislation in line with European directives and make the Commission responsible for "studying the dissemination of products of biomolecular engineering" (see LE MONDE, 3 October 1991). The Commission's composition and its new ground rules will be stipulated after final adoption of the bill, which the National Assembly is expected to discuss shortly.

ENERGY, ENVIRONMENT

PSA, Renault Implement Fender Recycling Programs

92WS0406B Paris L'USINE NOUVELLE in French 5 Mar 92 p 23

[Article by Jean-Michel Meyer: "PSA and Renault Recycling, Each On Its Own"; first paragraph is L'USINE NOUVELLE introduction]

[Text] Both car manufacturers are committed to removing plastic fenders from dumps and to organizing the recycling industry.

Does the PSA [Peugeot Corporation] group or does the Regie Renault group occupy the pole position with respect to the recycling of plastic fenders? Within 12 hours of each other, both manufacturers announced their intent to go it alone in the recovery of these plastic components. The PSA's crusher, developed by the Scotra Company, which specializes in the recycling of urban trash cans and industrial packaging, is being challenged by Renault's mobile crusher, developed by C2P, a subsidiary of Metaleurop.

The latter is a trailer truck equipped with a 2-tons/hr crusher. It pulverizes the plastic fenders collected and stored in French regional facilities and those of the manufacturer's European subsidiaries. The pulverized fenders will be used to manufacture vineyard stakes, and soon, new fenders.

The PSA group, for its part, plans to recycle the entire 800,000 fenders, equal to 2,400 metric tons, received annually from its concessionaires on the French mainland, before extending the project to its European network.

Gefco, the group's transportation unit, collects the scrap and routes it to the 17 crushing centers operated by the CFF [French Scrap Company] for "vehicles at the end of their useful life." The mobile crusher navigates from center to center putting the fenders through a precrushing stage. It has a capacity of 600 pieces, or 1.5 to 2

tons an hour, and reduces the volume of the pieces by a ratio of 1 to 12. Next, the scrap goes to the CFF centers' polymer processing lines.

The polypropylene crushings then return to the original supplier, the DSM chemical company. After new formulation, they enter, to the extent of 20 percent, into the composition of automobile parts: Mudguards, instrument panel inserts, heater and air-conditioner housings. Glass-fiber-reinforced polyesters are reduced to a fine powder, of around 100-micron gauge, and are used to the extent of 10 percent in the manufacture of shutters, front-end facades, etc. In the future, ABS [acrylonitrile butadiene styrene] radiator grills will also become part of the recycling chain and will live a second life in the form of rear-view mirrors, hub caps, and radiator grills.

The economic viability of the system, however, is not an immediate imperative. "The kilogram of processed material costs us 80 centimes, about equal to what it costs us to dispose of it as waste," says Jean-Yves Helmer, head of the PSA group's Automobile Division. "Similarly," he adds, "the cost of processing the scrap and the cost of the virgin raw material that we thus do not purchase also tend to balance out."

Where does the life of a recycled product end? "Polypropylene can be recycled from seven to 10 times, and even more," says Isabelle Trocherie, head of recycling at PSA. Since the life span of a vehicle is 10 years, polypropylene recycled 10 times will have a life span of a century. After which, it will be incinerated.

[Box]:

The Automobile: More Plastic, But Less Materials

On average, 12 percent of a vehicle's components are made of plastic. This means 1,200 to 1,500 of the 5,000 to 6,000 parts [as published] comprising a vehicle. Given their increasing use, this percentage can be expected, eventually, to exceed 15 percent. The materials used include, to the extent of 30 percent, polypropylenes, but also polyurethanes, ABS's, PVC's [polyvinyl chlorides], high-density polyethylenes, polyamides, and composites. But the manufacturers want to use only one type of material per major function and prefer recyclables. This favors the use of thermoplastics, such as polypropylene to replace composites for fenders, and ABS for instrument panels.

Switzerland: Mercury, Cadmium Battery Recycling Plant Presented

92WS0438C Paris INDUSTRIES ET TECHNIQUES in French No 721, 28 Feb 92 p 38

[Article by Andre Larane: "Batteries: The Swiss Cope"]

[Text] Since 18 June 1991, the Vaud canton is the home of a plant that is unique worldwide for its ability to process all categories of used mercury and cadmium dry cells and batteries. Recymet—for that is its name—recovers the mercury contained in the ordinary rod-shaped alkaline type of dry cell. It attained full output in November 1991 with an annual rate of 500 tons. Its final recycling capacity is to total 2,000 tons of batteries per year.

The method used by Recymet was developed by researcher Joseph Hanulik and has the advantage of recycling the reactive products themselves, such as the fluoroborates, thus enabling extraction of the metals by electrolysis. The reactor that receives the batteries releases no toxic waste products that it itself has not reprocessed. The inert waste it discharges and the waste burned in cement kilns represent, all together, 5 percent of the weight of the batteries processed. "All the installations are closed and ventilated," says Pierre Ammann, Recymet's manager. "Activated charcoal filters remove all dust and mercury from the air. These filters are designed to be regenerated every two to three years." Recymet adjusts the parameters of the process according to the batches of scrap, the characteristics of the batteries, and their quality. Initially, the batteries receive a heat treatment at 550°C. This releases mercury, oils, water, and a mixture of mercury and oil. The oils released by pyrolysis are burned in cement kilns, and the mercury is routed to a refiner. The mercury-oil mixture is reprocessed by cementation on zinc, from which mercury zinc compound is extracted and introduced into the following batch of batteries. After crushing and washing, the batteries release a saline solution containing heavy metals and a manganese dioxide mud, both recycled. The manganese dioxide mud, which also contains zinc, a small amount of cadmium, and graphite, is mixed with acid. The filtrate is routed to an array of electrolyzers, where the acid is regenerated, to be fed back into the circuit. The solid residues of the batteries are put through a magnetic sorter to remove the ferrous metals, then through an inductive sorter. The nonferrous metals (copper, zinc, nickel) are then recovered by anodic dissolution. The nonferrous metals are sold as metals of electrolytic purity. The energy consumed during the process totals around 4 kWh per kg of batteries processed. The batteries processing installations operates with eight persons. A parallel production line processes neon lamps by means of comparable chemical methods. The system as a whole required an investment of between 19 and 20 million Swiss francs. This is a sizable sum that is explained by the fact that Recymet has chosen a process that is applicable to a broad range of wastes, unlike ordinary installations, which process specific categories (button-shaped cells, lamps, thermometers, etc...). The cost of scrap brought to the plant comes to 3,630 Swiss francs (13,900 French francs [Fr]) per ton. The revenue produced by the sale of the metals being insufficient, the operation of the plant is largely financed by the tax levied since 1 October 1991 on the sale of new batteries throughout the Swiss Confederation, amounting to between 5 and 50 Swiss centimes (Fr0.2 to Fr2) per unit.

[Box]:

The French Lagging

The Recymet initiative is being closely followed in France. SARP Industrie, a subsidiary of the Groupe Compagnie Generale des Eaux holds a 25 percent stake in Recytec, the holding company that owns Recymet (see INDUSTRIES ET TECHNIQUES No. 717, 13 October 1991, p 42). Sita, a subsidiary of the competing group Lyonnais des Eaux-Dumez, has signed an industrial agreement with Recymet, under which the Swiss company will process the stocks of batteries collected by Sita in the course of its operation Kangourou in the Paris region and at Mulhouse. The EMS Services Company is awaiting the green light from the Administration to put into service a pilot recycling plant at Saint-Vulbas (Ain).

Europe's Largest Solar Power Station Opens in Swiss Alps

92MI0482 Bonn DIE WELT in German 28 Apr 92 p 25

[Text] The Phalk alpine photovoltaic power station, Europe's largest and most modern solar power station, goes into operation today, conceived by its clients and operators primarily as a research, development, and demonstration facility. A consortium of 11 companies, mainly from the electricity industry, hopes to use the project to research the economic viability and technical limitations of solar energy. Its designers expect the plant, located on what had been summer pastureland on the southern slopes of Mont Soleil, to have a nominal output of 500 kilowatts. The natural factors present are favorable as it is located at 1270 meters, above the normal fog line. Even during the winter, Mont Soleil receives so much sunshine that it is expected to feed an annual 700,000 to 800,000 kilowatt hours into the grid—sufficient to supply almost 200 households with electricity.

Almost 400,000 monocrystalline solar cells with a total surface area of 4,500 square meters are mounted on just 110 support platforms, thus obviating the need for the usual aluminum frame, which would have taken a year's electricity output to produce. Estimates of the time it will take to produce the amount of energy used in the plant's construction range from six to eight years. Nevertheless, despite the fact that the plant will pay for itself in terms of energy output between two and three times faster than older designs, the solar cells will generate electricity less cheaply than originally planned.

Following a rise in the plant's overall cost to 9.5 million German marks [DM], at DM1.70 per kilowatt hour, its electricity will cost almost double the DM0.90 initially estimated. Though the cost of generating electricity thus raises doubts as to the power station's economic viability, the doubts do not extend to its value as a research facility. It is intended primarily as a center for Swiss research groups wishing to develop and test new photovoltaic systems.

Germany: Juelich Center Coordinates Renewable Energy R&D

92MI0484 Juelich KFA INTERN in German Mar 92 pp 21-22

[Article by B. Kuhnert (REN) and S. Ambros (ACS): "REN + ACS = RES Coordinating Office"—first paragraph is KFA INTERN introduction]

[Text] The Land of North Rhine-Westphalia is streamlining and stepping up its work on "Renewable Energy Sources" and "Rational Energy Consumption." The "Rational Energy Consumption and Exploitation of Inexhaustible Energy Sources" (REN) project management team, which has been at work since November 1989, was joined by the "Solar Consortium" (AGS) office in August 1991. In November 1991, the two units were combined to form the "Rational Energy Consumption, Solar Consortium" (RES) Coordinating Office, which became a new organizational unit within the Juelich Research Center.

The special feature of the way this coordinating office functions is the close cooperation between the AGS, which is financed by the Ministry of Science and Research, and the REN management team, which reports to the Minister of Economic Affairs, Small Firms, and Technology. This link is intended to ensure that research and development (R&D) findings are efficiently developed into marketable commodities.

AGS Office

The Solar Consortium was set up by the Ministry of Science and Research (MWF) to promote research into solar energy. Its members include research and industrial bodies and municipal authorities. So far, applications have been made for more than 50 R&D projects for a total cost of over 50 million German marks [DM].

Six Main Topics

The applications were grouped under six main topics covering the following items:

- Design, construction, and trial operation of a self-sufficient electricity generating unit with an output of approximately 24 MW/h at the KFA. Photovoltaic energy will be used to generate power, and electrolysis and fuel cells will be used to produce hydrogen, which will act as the storage medium that will decouple the power supply from consumption.
- Development, testing, and promotion of small solar systems such as solar water supply systems, photovoltaic lighting units, solar measuring stations, photovoltaic pumps, solar refrigerators, etc.
- Solar architecture for active and passive solar energy exploitation; items include research and development on passive solar components, object and technique identification, software development, and conversion support in the form of training, further education, and consulting services.

- Building of a test facility for solar systems, development of test methods, and the testing of photovoltaic components to specification.
- A solar furnace to be set up and used in semiconductor technology, research on metallic and ceramic high-temperature materials, chemical energy storage, the photochemical production of chemicals, and solar effluent purification.
- Analysis of possibilities for the practical use of solar energy and the prospects for its development in North Rhine-Westphalia between now and the year 2020.

Early Conversion [Into Working Systems]

The office has not only taken over the technical and financial/administrative supervision of the projects, but also provides assistance with the early conversion of the new solar technologies into actual systems in close cooperation with REN, arranges seminars and training courses, and is responsible for the consortium's broad public image.

In their future work, the office's staff will be able to draw on the experience gained from heading up the Biology, Energy, and Ecology project.

REN Project

The basis for the land government's funding program on "Rational Energy Consumption and Exploitation of Inexhaustible Energy Sources - REN" is the gap between the energy potential at the disposal of the national economy and the actual use made of it, which lags far behind the opportunities.

Reducing the Energy Requirement

The Ministry of Economic Affairs, Small Firms, and Technology's REN funding program seeks to reduce the (primary) energy requirement. It involves funding for hydroelectric stations, wind farms, combined heat and power generation, the use of biomass for energy, solar power stations, and even solar and electric vehicles.

REN Supports ...

By funding research, development, and pilot projects in this field, the land hopes to stimulate new technologies and prepare the ground for their launch on the market.

The REN manager's task is to assess and support pilot projects falling within the program. Documentation and guidelines on the relevant programs may be obtained from the REN manager (Building 14.6, tel. 3580).

In 1991, the project manager's work centered on pilot projects on the following topics:

- Photovoltaics in the REN Program One example is the funding granted to the RWE [Rhine-Westphalia Electricity Works], for its Lake Neurath plant, which has a peak capacity of 360 kW. A further 31 applications in the power range one to five-kWp have been recommended for funding.
- Federal/Land "1000 Roofs" Photovoltaic Program. This federal and land program, which gives 70 percent subsidies, granted 51 funding applications in North Rhine-Westphalia for grid-linked photovoltaic plants with a total output of over 100 kWp for one- and two-family houses in 1991.
- Solar-Powered Components. Aspects include designs for buildings that make exemplary use of new solar components, demonstrating rational and economical energy consumption.
- Use of Biomass for Energy. Funding is given to innovative systems using biomass for energy. Preference is given to projects involving power generation on a combined heat and power basis.
- Use of New Technologies for Rational Energy Consumption. This addresses designs for industry and private households that make an exemplary contribution to rational energy consumption.

[Boxed Insert] Coordinating Office for the Land of North Rhine-Westphalia—Rational Energy Use—Solar Working Party (RES)

Office

Solar Working Party (AGS)

- Photovoltaic, electrolysis fuel cell
- Development of independent medium-sized solar power systems
- Building to save energy with solar power
- Testing and quality control for solar components
- Solar chemistry, solar materials research
- NRW energy potential study

Sponsor

Rational Energy Use and Use of Inexhaustible Energy Sources (REN)

- Demonstration projects: solar powered components, use of biomass for energy, use of new technologies for rational energy use;
- Photovoltaics, including Federal/Laender governments' 1000 Roofs Photovoltaic Program

German University Uses Mussels to Test Water Quality

92MI0501 Bonn WISSENSCHAFT WIRTSCHAFT POLITIK in German 22 Apr 92 p 4

[Text] Zoologists at the University of Cologne have developed a biotest system in which mussels of the *Dreissena polymorpha* species (zebra mussels) detect pollutants in the waters of the Rhine. The researchers have attached small magnets to the shells of the mussels. As soon as the mussels close their shells, the magnets generate a signal via a toggle switch sealed in glass. The signal is recorded by a computer. Even the trembling of an "undecided" mussel is measured and evaluated. By monitoring many mussels simultaneously, the computer can form a picture of the state of the water.

The first mussel early warning system is already being put to the test in daily operation at the North Rhine-Westphalia Water and Waste Center's Rhine quality measuring station at Bad Honnef near Bonn, where two sets of 42 mussels are exposed to the Rhine water in two flow channels. Every second, a computer checks whether the shells are open or closed. Sudden closure of more than 30 percent of the mussels is a danger sign, and the computer sounds the alarm.

The zebra mussel is one of the more "robust" species. It has its natural habitat in many lakes and rivers with calm, dammed stretches, and they are to be found in large numbers even in the Rhine, with its water pollution and diverted sections. Professor Dietrich Neumann of the Zoology Institute at the University of Cologne regards the mussel test method as particularly meaningful, precisely because it uses a species that is at home in the habitat being monitored, and which still occurs there. The mussels' reactions are therefore indicative of living conditions in the river. By contrast, other biotests always use more sensitive organisms that are extraneous to the natural biocoenosis of the system under investigation and are often permanently damaged by the polluted water.

The zebra mussel reacts with great sensitivity to some pollutants, such as the timber and leather preservative pentachlorophenol (PCP), or the insecticide lindane. If, however, the phytotoxin atrazine occurs in the water, the mussels do not close their shells until very high concentrations are reached. For a complete water monitoring system, therefore, the mussels would have to be used in conjunction with other biotests. Only a "test battery" of different biological early warning systems (algae, bacteria, crustacens, etc.) would make it possible to detect the full range of toxins. An alarm would then enable the chemists to look for specific individual pollutants.

According to Professor Neumann, the future of the method, which has a good level of automation, lies in the permanent monitoring of discharge points. The early warning system could be used at the sewage works or industrial plants themselves, to draw attention to any increase in the level of pollutants discharged. The effluent would have to be diluted for test purposes to simulate the conditions encountered at the discharge point. However, the environment policy decisions needed to introduce this type of monitoring system are not yet forthcoming.

LASERS, SENSORS, OPTICS

Aerospatiale Creates IQL Industrial Laser Production Subsidiary

92WS0518B Paris INDUSTRIES ET TECHNIQUES in French No. 724, 10 Apr 92 p 62

[Article by Michel Alberganti and Mirel Scherer: "The Right Start for French Lasers?"; first paragraph is INDUSTRIES ET TECHNIQUES introduction]

[Text] Aerospatiale has not despaired after its setback with Lisa, and is launching a new French firm to manufacture industrial lasers.

There is a new chapter in the action-packed continuing drama of French industrial lasers. Lisa is out and IQL [Industrial Quantel Laser] is in. Gerard Andrieu is the president of the new IQL company, which will employ 30. He sees IQL as the "new hub of the 'industrial laser' activities—including Lisa's CO_2s and Quantel's Yags—of Aerospatiale's various subsidiaries." Aerospatiale, you will recall, was able to create Lisa by acquiring an integrated-turbine CO_2 laser technology from the German firm Held. And Quantel, an international company that specializes in low-power lasers for scientific use, had developed an industrial Yag laser through a EUREKA program.

IQL thus finds itself with a fairly broad laser line. The new company is an Aerospatiale subsidiary through Quantel (90 percent) and Unilaser (10 percent). But Held's CO_2 laser, which features a good-quality beam, is rather expensive (75,000 French francs [Fr]) and not very profitable for the manufacturer. So IQL set out to find an economical source to cover subtreatment applications that do not require special fine cutting. It found its rare bird in Eastern Europe. The manufacturer is a Bulgarian firm whose track record is impressive: 400 lasers sold, 350 of them in the former USSR. "The company's 1.5 kW laser is very traditional and robustly built," explains Gerard Andrieu. And its price is unbeatable: Fr600,000, or 20 to 30 percent below market price. "Fanuc markets lasers that cost less, but you must also buy their NC (numerical control) and motors. That raises two drawbacks for the user," adds Alain Diard, IQL's general director. "Not only is he tied to a single supplier, but the price quickly becomes prohibitive." A Franco-Bulgarian research program funded by Aerospatiale reviewed and corrected the laser; moreover, the French firm is considering purchasing the Bulgarian company outright. "That will give us a laser line covering CO_2s (1 to 1.7 kW, Fr500,000 to Fr800,000) and Yags (300 W to 2 kW, Fr500,000 to Fr2,000,000) by late 1993," says Alain Diard. IQL is also developing excimer lasers with Laserdot, as well as high-power (3 and 5 kW) CO_2 lasers.

"Our goal is to sell a hundred machines a year," says IQL's general manager. "That is the minimum to stay in the market." The question is whether his company can succeed alone. The know-how of a machine-tools manufacturer—say Cheval Freres—could help IQL find a place in the sun.

German Firm Develops Innovative Sensors

92WS0521A Coburg MASCHINE & WERKZEUG in German Mar 92 pp 12-18

["Quo Vadis Opto-Sensors"]

[Excerpt] *Sensor technology is on the march. Beginning with the standard industrial sensor of the late 1980s, the*

further development of "artificial sense organs" is currently bounding forward at a terrific speed. Catchwords like microsensors, communication between sensor and control, composite sensor, or connection via bus system are right in the main stream. In late February, "Maschine + Werkzeug" was given an impressive overview of the latest developments in sensor technology from a very innovative sensor supplier on the north slope of Weser mountains.

[passage omitted]

The proud, Westphalian mother company of the just two-year-old Lower Saxon daughter firm had earlier added "Specialized Factory for Switching Contacts" to the name of its founder "Hans Bernstein" to expand the company name. Knowing this is to have a reference point as to where the business has its roots. The parent company now does business under the name Bernstein Switch Systems GmbH. After the confusion of the post-war period had cleared up, this "classic" medium-sized company made a steep climb upward and now has (figures are for '91) about 470 employees and an international, well-managed, yearly turnover of 80 million German marks [DM].

High-Intensity Light Flashes

But back to the aforementioned light barriers and light pushbuttons. Modern technical products operate on the basis of different, but closely related physical principles, according to which the systems can be divided into three groups:

- One-way light barriers consist of a light emitter and an opposing light receiver. When a probed object breaks the light path between the emitter and receiver, the light beam cutoff is recorded in the receiver and a switching signal is emitted. Usually an infrared LED serves as the light emitter, while photodiodes or phototransistors are used as receivers. The requisite small aperture angles are usually produced by offset lenses.
- Reflection light barriers are a more economical further development of the one-way light barriers. Both emitter and receiver share a common package. The emitter light beam is reflected back to the receiver by a retroreflector (triple mirror). The advantage over the one-way light barrier derives from the more economical installation and the lower costs because a simple triple mirror can be used instead of the receiver. The disadvantage resides in the fact that probed objects with glittering surfaces, like mirrors, can cause faulty switching. In addition, the ranges achieved by reflection light barriers are not as great as in the case of one-way barriers, since the light path in the former is twice as long for any given range.
- In the case of a light pushbutton, the light from an emitter returning from the probed object is itself reflected to the receiver. A switching procedure is triggered when a specific light intensity in the receiver is exceeded. For that reason, the maximum distance between the probed object and the light pushbutton, in which a switching signal is initiated, depends on the reflection properties of the probed object. There is something else that should be noted. Precisely such a light pushbutton, as just referred to, produced by Bernstein Optronic, even succeeds in selecting the almonds to be used in making marzipan! From the point of view of the electrical equipment, in a one-way light barrier a pulse generator controls the infrared LED built in the emitter that delivers the high intensity light flashes. These light pulses are subsequently converted into a luminous flux by a photodiode in the receiver. This flux, in turn, is processed by a selective amplifier and is finally converted into a voltage signal, after which a pulse former produces rectangular pulses of constant duration. When a sufficiently high number of pulses has been accumulated (indicating that the light path between the emitter and receiver is free), the threshold value switch, and then the circuit breaker, are activated. As might be expected, an analogous circuit diagram exists for reflection light barriers and light pushbuttons in which the emitter and receiver are housed in a single unit.

Design of a Miniature One-Way Light Barrier

When it is a matter of the demanding technology of modern opto-sensor—often referred to with respect to the fine detailed work—then Werner Winkelhake in Bueckeburg is "in his element." After being trained as a television technician, this enterprising 36-year-old engineer went on further to study electrical and communications technologies in Bielefeld and Lemgo. He has been active in the development of optoelectronics at the Bernstein enterprise since 1988.

Winkelhake demonstrates specifically just how far the trend to sensor microsystems has progressed (by the expression "microsensor technology," we understand the placement of short-circuit-proof sensors in the smallest of places). Sensor expert Winkelhake introduces a case example successfully completed recently at the Bueckeburg operation: "We set out to determine whether a one-way light barrier with good optical properties could be installed in a very shallow package."

With only a 12-mm overall depth to work with, the focal length of the offset lens assumes special importance. The observation that lenses on the free market are mostly optimized for optical images with few errors seems particularly appropriate. Since lens errors and distortions increase as the focal length shortens, lenses with short focal lengths (therefore: thick lenses) are really unusable.

In the case of a light barrier, it is more a matter of focusing incident parallel light on the semiconductor crystal of an optoelectronic component to the best degree possible. Imaging errors and chromatic distortions play a subordinate role here since the operation is performed

with monochromatic infrared light. For the 12 x 12 x 55 mm package, Bernstein developed a plastic lens made out of polyamide.

First of all, the beam path through the lens is simulated by means of a computer program; the curvature radii, the diameter as well as the placement of the semiconductor crystal are all determined in this way. The program computes, among other factors, the aperture angle of the marginal rays as well as the thickness and useful diameter of the lens, taking into account the laws of refraction and total reflection. After the radii and mass of the lens have been determined, a sectional drawing of the package, with all planned components, is prepared, showing the position of all the mechanical components like the lens, spacer sleeve, and printed circuit boards. As engineer Winkelhake puts it: "Now you can see that sufficient space still exists from the back side of the printed circuit board to the edge of the package, so that loading the circuit board does not protrude over the package edge." The mechanical design is established in this way.

The development of the electronic circuitry began at the same time as the mechanical design. "The use of three integrated circuits," Werner Winkelhake explained, "made it possible to reduce the number of discrete components to the point where the circuit could fit and be assembled on a double-sided SMD-loaded printed surface board without any problem."

After the lens became available as a plastic moulded article, the final determination of the aperture angle followed by adjusting the length of the spacer sleeve between the lens and the photosemiconductor. In doing this, a compromise must be sought between a small and a large aperture angle (the former choice results in a greater range, but requires tedious adjustment; the latter means a smaller range and greater optical susceptibility to interference, but it can be adjusted easily). Winkelhake described the decision in a brief statement: "An aperture angle of about 6° was selected. This yielded a typical range of 8 to 9 m, so that a data sheet value of 6 m could be given."

How Does "Interactive" Sensor Technology Function?

"Since 1990 we have been very much involved with our light barrier program and will use the degree of fame we now enjoy with inductive limit probes and ignition switches to bring new optical sensors to the market," the company's managerial board affirmed and continued, "we are, in addition, also practicing new techniques. We have taken up the cause of microsensor technology and, in that specialized field we are trying to mount short-circuit-resistant sensors in the smallest space."

To be able to successfully maintain a competitive position in the dynamically developing optoelectronic sensor technology field over the long run, this alone would scarcely suffice. To be sure, this fact of business life is clearly recognized in Porta Westfalica as well. Consequently, they have also placed their bets on a second horse, called "interactive sensor technology." "Sensors without the disadvantages of mechanical contacts and with built-in polarity reversal, induction, and short circuit protection represented the state-of-the-art in the late 1980s. The desired properties are reliably fixed in the sensor during the design and production stages; they are almost predetermined in the genetic sense." The man who explained this is numbered among the few real insiders in advanced sensor technology in Germany: engineer Rolf Wecke, born in 1943, studied machinery manufacturing with emphasis on precision mechanics and then went on to high-frequency technology (silicon epitaxy). After being employed by Volkswagen, Fuba, Miele, and at the Semiconductor Institute of Hannover University, he joined up with Bernstein, where, since 1975, he has been the technical director responsible for product development, fabrication, and documentation.

He was for us almost the predestined contact to analyze future special developments in optosensor technology. Wecke announced that "solutions are currently in development with additional capabilities, aside from those names earlier, which are already being applied in prototypes."

The first stage of further development would be analog standard sensors that do not simply deliver a yes/no signal, but rather a flux appropriately proportional to the movement. When the detected object is far away, there is a weak flux, when it is nearer, there is a correspondingly high ampere number—or vice versa as well. Besides inductive designs, Wecke has already devised optical sensors that operate in the manner just described.

Sensor That Can Be Programmed Via Control

When additional capabilities are built into a sensor, which also contains a certain "learning capability," then the step to an "intelligent" sensor has been taken. What is decisive in this development is that the sensor contain redundant functions which enable it to adapt to changing conditions. Rolf Wecke comments: "Present-day standard sensors can only emit their signals in one direction and cannot pick up a directed signal. The developmental trend here in Bernstein is to produce a sensor capable of communicating with a control facility. The control facility, which has received the sensor's signal, can then return a command to the sensor, which again alters its properties."

Here is an example for the purpose of clarification. The problem of background visibility sometimes occurs in optical sensors based on the reflection principle. The sensor may activate not just for the object being recognized, but may also react to other, irrelevant objects as well (e.g., shiny surfaces in the background). This problem can be resolved by a singular optical arrangement—triangulation. In triangulation, the emitter and receiver are positioned at a specific angle to each other, and aligned to a single point to be detected.

However, if now another point is detected, this principle of operation is no longer operative. Consequently, Bernstein is now designing a sensor, in which the spacing as well as the background fading can be electrically adjusted. A semiconductor with differing light-sensitive points, effected by variable voltage, is positioned in the image plane. The connected control can then program the sensor by adjusting the voltage to the appropriate spacing or background.

Communication between control and sensor should not be solely limited to adjusting the spacing however. In many cases, another option, which can switch-off the sensor for a limited period of time without inactivating it, is available. If one were to simply interrupt the circuit, then when the circuit is reactivated, a switch-on delay of about 50 to 200 ms results, capable of disrupting the operating sequence.

That is not the whole story, however. Communication between sensor and control can also mean that different technologies, which are activated at specific times by the control, are combined in one sensor. Wecke explains: "We use the expression, composite sensor technology, when at least two sensor systems are contained in one package. In one such instrument we designed, one capacitive sensor is combined with an optical system. The parallel use of several technologies—either already combined in the sensor or in conjunction with control and bus systems—opens countless possibilities for the future."

It may be extrapolated from this that in complex production systems, employing intelligent sensors, the control has to communicate not just with one or a few sensors, but with many such components. Since each simple yes/no sensor already requires at least two or three connecting wires, it is easy to imagine the enormous wiring project that would be required should a number of intelligent, communications-capable sensors be combined directly with one control.

Connection Via Bus Systems

Just such a comprehensive communications system has already been produced by means of a bus system. In this system, data can flow back and forth between numerous sensors and a control unit along the same path, say, a cable. This system is implemented by means of an established signal coding arrangement, so-called address and response systems. In this arrangement, each sensor only recognizes its own pulses, modulated in a distinct way, and responds, for example, with a pulse reversed 180°.

The fact that several hundred sensors can communicate over a bus line can be explained by the superposition principle. This principle states that in electronics technology a certain amount of overlapping of pulses is possible. Consequently, a number of electrical devices can be queried and controlled merely by a two-wire cable. Naturally, the superposition principle has its limitations. The maximum transmission speed is dependent on the transmission frequency and the kind of modulation selected. When the proper frequency is used, data can be communicated from and to more than 1,000 sensors.

At the present time, there are many different bus systems on the market with individual address and response systems. Engineer Rolf Wecke therefore requests that "because of the great variety, it is necessary to establish standards in order to be able to develop compatible components." But this experienced engineer is himself active in doing just that. He knows how the problem can be resolved. Wecke confides: "We are currently working on sensors, which, when market-ready, will be compatible with many bus systems."

MICROELECTRONICS

Need for European Chip Production, Subsidies Defended

92WS0511A Duesseldorf HANDELSBLATT in German 23 Apr 92 p 17

[Article by Joachim Weber and Georg Weishaupt: "ZVEI: European Industry's Abandonment of Chip Technology and Its Risks; Wissing: New Dimensions of Microelectronics Problems Require New Way of Thinking"]

[Text] Frankfurt, 22 Apr 92—Dr. Franz-Josef Wissing wants to deal with the emotion-laden discussion concerning the production of chips in Europe objectively: "We must quite soberly ask ourselves about the risks in terms of our national economies and the technical aspects of supply that will arise if we Europeans lose our direct access to microelectronic products," the chief secretary of the Central Association of the Electrical and Electronics Industry (ZVEI) insisted and immediately asked the question that is the natural consequence of this: "How high an insurance premium are we willing to pay to assure ourselves access to this key technology?"

For him, the answer is clear: "To cover a national product of DM2.4 billion, it seems to me that a coverage of from DM4 to DM5 billion is really a bargain." Namely, that is how much it is estimated that the advance outlay (research expenditures and investments) for the production of memory chips for each new generation with a storage capacity of, for the moment, 16 and in future 64 megabits would amount to.

Chief secretary of the industrial association since 1 July of last year, Wissing, in a conversation with HANDELSBLATT, underlined the key importance of semiconductor technology for German industry: "At least about 45 percent of our gross national product depends directly on microelectronics." This holds especially true for the auto industry, mechanical engineering and other users of

industrial electronics, consumer electronics, data technology, and telecommunications, and not least of all for measurement technology and control engineering as well as medical technology.

Chip Production Is a Problem for the National Economy

Consumption of microelectronic products in the important customer sectors will increase from DM4.7 billion (1990) to DM14 billion by the year 2000. Along with this, the microelectronics industry's share of production value will also be increasing. This development is especially noticeable in the electrical industry sector itself. While in 1970 only 31 percent of the industry's production was directly dependent on electronics, in 1991 56 percent already was—by the year 2000 that figure should rise to at least 70 percent.

A similar figure is arrived at for the national economy if we include the service industries (like banks and insurance companies), which can no longer operate at all without this technology: "Then two-thirds of the gross national product will depend on microelectronics," Wissing emphasized. He drew this conclusion from the fact: "The question as to whether we Europeans will in future be involved in the chip business or will take our leave of it is neither a company nor an industry problem, rather it concerns the national economy, especially precisely those sectors that rely on electronics, which promises them the fastest growth."

In the event that Europe should give up chip production, the worldwide monopolies in this field have, as Wessing sees it, already been programmed. Then the few suppliers in the United States and Japan ("Japan is an energy volcano as far as productivity is concerned") could dictate semiconductor prices. Moreover, there may no longer be any guarantee that European combines would be provided with fast service and the necessary quantities of chips since they already use more semiconductors today than they themselves can produce: "The misuse of monopolies to support the market power of national buyer industries as well is not far off."

However, the past has shown that not even the big electronics combines like Philips and Siemens are any longer in a position to come up with the enormous outlay for the development and production of new chip generations on their own. Big European Community research projects like JESSI [Joint European Submicron Silicon Initiative] have not produced the desired success for the industry in competition with the Japanese either. In Wissing's estimation, those in charge realized too late that with these projects "not only the strengths of the partners add up, but also their weaknesses."

It may nevertheless be doubtful whether they will succeed in distributing the burden of developing chips over the market on private shoulders. Thus, European chip production may not be competitive in comparison with Japanese production. This could, among other reasons, be due to the limited nature of the national markets in Europe, each with its own rules, which would not permit sufficient production volume. To be sure, the domestic market may offer a promising solution to this. But then too, Japan's combines would still have the advantage of more favorable financing possibilities.

Call for State Aid for Interim Phase

This is why the head of ZVEI is calling on Europeans to rethink their rules policy: "The new dimensions of the national economy and the hitherto unique global structure of the problem require new premises—it is by no means certain that the usual market mechanisms will lead to a reasonable solution with respect to this." Without any intervention and subsidization by the state at all, this probably will not work.

Wissing, however, does not just want to dig into the horn of subsidy. Having turned to Siemens and Company, he appeals to the industry "to make its own contribution to the development and production of chips as big as possible." To achieve this, partners from countries outside the EC would also have to be included in the deliberations on cooperation.

Until the necessary alliances materialize, however, as the ZVEI strategists see it, the European semiconductor industry will have to get through an interim phase: "This kind of vital cooperation is a matter of trust and trust grows slowly." State aid would be required for the time being. But to keep state payments from escalating, he would welcome it if public financial aid were limited to a definite period of time. For industry, the ideal picture would be for the difference remaining after financing to come to about zero.

Wissing places a great deal of importance on medium-sized firms as well as big companies' profiting from the advances made in microelectronics: "The flow of knowledge from the big laboratories to the many application sectors among the medium-sized firms must function smoothly." It is precisely the small and medium-sized businesses that have the necessary flexibility to make use of the diverse possibilities afforded by application-specific chips, the so-called ASICs [application-specific integrated circuit]. The VDE/VDI [Association of German Electrical Engineers] Microelectronics Association (GME) is counting on a further increase in the use of ASICs until the turn of the century.

Semiconductor Research in East German Institute Described

92WS0554A Stockholm NY TEKNIK in Swedish 23 Apr 92 pp 20-21

[Article by Norbert Andersson: "'Swedish' Professor Sprucing Up East German Research"—first two paragraphs are NY TEKNIK introduction]

[Text] Following the fall of the Iron Curtain, Europe is becoming an international melting pot and this includes technical research. A stone's throw from the Polish

border a German-Swedish professor, Hermann Grimmeiss, is building up an ultramodern research institute with eastern German researchers and western German money.

The goal is to be the first in the world to come out with rapid, cheap and tightly packed memory circuits of silicon germanium.

Hermann Grimmeiss is about to fulfill a dream—building up a big research institute from scratch on the basis of an idea. An institute with ultramodern equipment and 120 capable and experienced researchers. And in addition being able to do all this without having to count every penny.

Here in Frankfurt an der Oder near Germany's border with Poland, Grimmeiss has become head of the Institute for Semiconductor Physics.

In the laboratories and clean rooms, shiny new West German and American equipment stands side by side with somewhat older Russian, East German and Czech apparati.

The institute is gradually being modernized at a cost of 75 million kronor and the premises are being painted and refurbished.

The dreary East German decor will soon be found only in Grimmeiss' big executive office; tubular furniture, drab wallpaper in indeterminate colors and dark cabinets made of imitation wood.

"I deliberately decided not to buy new furniture," Grimmeiss explained. "I wanted to convey the message that everything will go into research."

Different Leadership Style

He is using a different style of leadership to run the institute. Where Germans rely on Prussian orderliness, hierarchy and sets of rules Grimmeiss is leveling the pyramid and trying to assemble his workers around shared goals.

"Swedish research leaders should be an excellent export item," he said.

Well in Sweden Grimmeiss is regarded as a German, in spite of the 25 years he spent there. But here, in his old homeland, he is "the Swede."

It was as a German-speaking foreigner that he was approached two years ago by the German Science Council. In connection with the Federal Republic's assimilation of the German Democratic Republic (GDR) the council wanted to introduce the West German research system in East Germany. In the GDR research was conducted mainly by research institutes that came under the Academy of Sciences. Of the 24,000 employees in the natural science area 8,000 were researchers and 10,500 were technicians. Only a marginal research effort was carried out at universities.

As the two German states had only limited contact with each other, the West Germans were unfamiliar with the East German research landscape, while Sweden, for example, had had extensive cooperation with the GDR in the area of scientific and technical research.

The Bonn government eliminated the GDR's Academy of Sciences and dismissed all its employees. Many of the best researchers quickly obtained jobs at universities and technical colleges. Others were recruited by the more or less independent German research institutes.

Considered Unnecessary

But now it was a question of organizing East German research according to West German principles.

The Institute for Semiconductor Physics in Frankfurt an der Oder was considered totally unnecessary by the West German experts.

It worked mainly on pure development for the East German semiconductor industry whose days were now numbered.

In addition the equipment was old by West German standards.

But the area east of Berlin is part of Germany's internal development area and therefore it was decided to allow the institute to keep going in a new form.

Rebuilt

Grimmeiss was asked to rebuild the institute. And he was given a very free hand.

"It was a real dream assignment for a Swedish researcher. Imagine, 120 researchers and 30 administrators in an independent institute that is provided with basic funding. And no teaching duties!"

The institute had an advanced process line for integrated circuits, which enabled it to mass produce small quantities of the circuits developed by the researchers.

This was regarded as totally worthless in West Germany because the big electronics firms have considerably more advanced production equipment.

But Grimmeiss sees the production line as the institute's strength:

"A basic researcher in physics normally knows little about process technology. And a microtechnician knows extremely little about basic research.

"For the first time we were able to gather basic research, development and production of experimental circuits under the same roof."

Silicon Germanium

And in a short period of time Grimmeiss has now built up a modern institute around a major concept he brought with him from Sweden: integrated circuits of silicon germanium.

Back in Sweden he sought in vain for a positive response to the idea. Instead people in Sweden continued to work on gallium arsenide.

But Grimmeiss says gallium arsenide circuits cannot compete in price with silicon circuits. Gallium arsenide will be reserved for functions where the material's optical properties are utilized, in sensors, for example.

However basic research on silicon germanium shows that such circuits can be almost as fast as gallium arsenide circuits and that they can both generate and react to light.

Silicon is Cheaper

And the silicon technique is a good deal cheaper.

In the days of the old regime the institute had also developed a new way of producing memory circuits that is well suited to the silicon germanium technique.

Briefly the method is based on building up silicon layers in condenser-like formations. This produces smaller structures than are obtained by etching. The circuits can also be built up in three dimensions to further increase speed.

"We should be able to do all this in Sweden too," said Grimmeiss. "Even though we may not have as many resources as the Germans.

"But in Sweden there is solid opposition to independent research institutes. I should be able to get things rolling overnight—we have the researchers as well as the equipment and the expertise. The only thing needed is organization."

But interest in the technique he is now developing here in Germany may eventually increase in Sweden. And he hopes that research cooperation will expand, not only across the Baltic Sea but in all of Europe.

"If Europeans make a joint effort instead of emphasizing parallel development in each individual country Europe would be number one in many more areas," he said.

Illustration Captions

Holes and Pins Become Tightly Packed Memory

The special method for dynamic memory circuits that was developed at the Institute for Semiconductor Physics in Frankfurt an der Oder involves building up the structures step by step. The aim is to create circuits with 256 million memory units (256 MDRAM). The memory units are either built up around holes (see illustrations [captions below]) or pins that are etched out of a layer of silicon dioxide on a sheet of silicon germanium.

1. First small 0.5-micrometer holes are etched in a layer of silicon dioxide covering a sheet of silicon doped with germanium.

2. Then a thin layer of aluminum is applied.

3. Next a layer of silicon dioxide is applied.

4. A second layer of aluminum is applied. After that another layer of silicon dioxide and finally a last layer of aluminum.

5. Then the superfluous metal layers are removed.

6. Finally the silicon dioxide is etched down, leaving the aluminum walls standing in condenser-like formations.

SUPERCONDUCTIVITY

GEC-Marconi Develops Superconducting Ceramics

92WS0406A Paris AFP SCIENCES in French 27 Feb 92 pp 30, 31

[Article: "GEC Announces a Discovery in Superconductors"]

[Text] London—The British General Electric Company [GEC] group has disclosed that its subsidiary GEC-Marconi has made a discovery with potentially important applications in the domain of superconductors, and in that of the transmission of electricity at high voltages without energy losses.

A GEC-Marconi research laboratory has developed a number of new ceramics whose performances promise to exceed those of currently existing "high-temperature" superconductors. These ceramics are said to be specifically suited to the transmission of current at high voltages over long distances.

Superconductors, invented in 1986, lose all resistance at a temperature of -196°C (the temperature of liquid nitrogen), but to date they have proven incapable of carrying current at high voltages, and no significant conducting material has been discovered since 1989, according to GEC.

The new materials developed by GEC after two years of research are based on cadmium, lead, and copper oxides, and are stable and reproducible. They do not exhibit the volatility and toxicity of conventional thallium-based superconductors, according to GEC-Marconi. The research was carried out with the aid of a robot that enabled 15,000 different chemical combinations to be tested.

The project was placed under the aegis of the European Community's BRITE-EURAM materials research program, and was carried out in collaboration with the GEC-Alsthom, BICC, ABB (Asea Brown Boveri), Alcatel Cable, Pirelli Cavi, and Siemens firms. Details of the research are published in the February issue of the Superconductors Science And Technology magazine.

TELECOMMUNICATIONS

France Telecom Prepares to Join Syncordia

92WS0406C Paris L'USINE NOUVELLE in French 5 Mar 92 p 26

[Article by Jean-Pierre Jolivet: "By Joining Syncordia With the British, Germans, and NTT, France Telecom Joins Battle of International Networks"; first paragraph is L'USINE NOUVELLE introduction]

[Text] The stakes: The value-added telecommunications market for the big business enterprises. Staying out of it is out of the question.

Internationalization is one of France Telecom's top priorities. Its president, Marcel Roulet, would therefore like to associate his enterprise with British Telecom, Deutsche Telekom, and Japan's NTT in the future Syncordia network. Absent that association, he knows, France Telecom would end up excluded from a particularly profitable market.

With the British at its origin, this project seeks to bring the big telecommunications operators together to set up an international private telecommunications network offering its services (voice, data, image) to the big multi- and transnationals, that is, to the pick of worldwide enterprises. The stakes are sizable: The value-added telecommunications services market will double by the end of the current decade, to over 4,000 billion French francs [Fr].

But it is also an opportunity for the national operating entities to check the expansionist trend of major competitors such as Electronic Data Systems (EDS), General Electric Information Systems Company (GEISCO), and even IBM, which already has worldwide networks of this type.

France Telecom's president Marcel Roulet is conducting hard negotiations in a climate of severe competition between France Telecom and British Telecom. This competition dates back well beyond yesterday. British Telecom has set foot on the French market and has even dared to land the management of the Axa Insurance group's international network. Axa Insurance is one of France Telecom's big clients. The French, for their part, have not hesitated to hunt on British preserves. France Telecom's subsidiary Transpac has recently landed the London Regional Transport network, which will bring it into close touch with some 2 million users over the next four years.

Despite British reluctancy, but thanks to support by Deutsche Telekom, the principle of welcoming France Telecom into Syncordia now appears agreed. " Our joining will nevertheless be subject to terms and conditions that have yet to be negotiated," says France Telecom, which does not want to be forced to accept humiliating terms at the hands of the British. Be that as it may, France Telecom can hardly expect to make out on its own. "The Syncordia operation will provide the sector with a definitive structure," said France Telecom's director general Charles Rozmarin recently.

Failure to join the Syncordia consortium would compel France Telecom to turn toward other big potential partners. One possibility might be AT&T, which is preparing, moreover, to take control of the French SSII [data processing services and engineering company] Dataid. France Telecom can hardly hope to realize 10 percent of its activity in the international sphere without resorting to alliances, hence making a few concessions.

COMPUTERS

Poland: CA80 Microcomputer Described

92WS0569A Warsaw RADIOELEKTRONIK in Polish Apr 92 pp 3-5

[Article by Stanislaw Gardynik: "The CA80 Microcomputer"]

[Text] This article presents the latest model of the CA80 microcomputer described in RADIOELEKTRONIK No. 9, 10/1988, offered by the MIK Company, Stanislaw Gardynik, Olszowa Street 68, 05-090 Raszyn, as well as programs and applications heretofore designed for it.

It may be said without hesitation that microcomputers have made headway in our country. In their decisive majority, these are personal computer models ZX Spectrum, C64, Amiga, Atari 800XL, Atari ST..., intended mainly for entertainment. The overwhelming majority of users of those computers play computer games and operate the joystick.

Increasingly gaining in popularity are personal computers compatible with the IBM PC which then interface with the peripherals, i.e., database, spreadsheets, and text editors. The authors of those programs are concerned above all to make programs user-friendly for an average person. As a rule, one can rapidly learn to operate them even without having the faintest idea about computer programming and electronics.

In our country (and not only here) we may note a very distinct division of specialists in programming (informatics) and in hardware (electronics). The former usually do not know the fundamentals of electronics, while the latter are incapable of creating a simple program. In view of the demand for versatile specialists, the time has come to define a new profession, i.e., microelectronic specialist—a person who uses microelectronics as means of control and management.

Well-appointed control systems on the microprocessor basis must aim at absolute minimization of hardware designs (the fewer the integration units the better), and everything possible should be turned over to software programs. Such solutions are the best because an input system is rather inexpensive and simple to install and copy.

From the above it follows that an expert in microelectronics must master the principles of classic electronics and above all, be able to write and set up computer programs correctly. The purpose of operations of the "MIK" Company since 1985 is to implement in general the slogan "Microelectronics for Everyone" to an unprecedented extent worldwide. Under that concept one should understand utilization of microprocessors for control and management. This idea has motivated the organization of the "MIK" company and all its operations thus far.

A standard product of the "MIK" company designated for automatic assembly is a very inexpensive control named CA80. In 1985 it was a microcomputer composed of three single-sided disks with several scores of tracks—as described in "RE" No. 9, 10/1988. A new version of CA80 has been available since 1 September 1991.

The new CA80 is available on one expertly designed double-sided MIK190 diskette with metal windows, with double-sided green soldering mask and a white diagram of assembly appearing on the side of the components. A very attractive jacket made of ABS plastics is provided for the diskette. The built-in keyboard of conductive rubber (as in controls) has two-colored plastic keys, which makes the inscriptions on the keys attractive and indelible. The CA80 feeder is placed in a separate frame made of synthetic materials.

A Japanese 8-LT-12Z 8-position screen, with green luminosity and with 16 mm high digits, is preferred for the new CA80. The LED screen with a common cathode or anode may also be used without any difficulty.

A block diagram of the new CA80 appears in the drawing above. Except for a few minor details, the conceptual scheme of the new CA80 is the same as that of the older model.

Every program written for the old CA80 will certainly work also in the new one, and vice versa. The most significant "addition" to the CA80 is extensive literature consisting of nine volumes with a total of 1,750 typewritten pages. "The MIK01 Electronic Primer" presents unusually effectively practical applications of Ohm's law and of two Kirchhoff's laws in classic electronics. "The MIK02 Microelectronic Primer" acquaints the reader primarily with basic concepts applied in microelectronics and also introduces him to the study of programming in the language of the assembler of the Z80 microprocessor. "The MIK03 Principles of Digital Technology" uses the form of a non-stop workshop to introduce us to the basics of digital technology, i.e., the TTl and CMOS systems useful in microprocessor technology. The MIK03 contains a catalogue of digital systems of the 74' and 4000 series, including outputs, electrical and timing parameters, truth tables, and time charts of about 200 systems of series 74', 74LS, 74S, 74F, 74ALS, 74AS, 74AHC, 74HCT and 4000. "The MIK04 Principles of Microelectronics" describes in detail functions of the systems Z80ACPU (microprocessor), Z80ACTC (timing system), 8255A (parallel input/output systems) as well as of the EPROM and RAM memory. "The MIK05 CA80 Microcomputer" and "The New MIK09 CA80" offer detailed data on both the older and new CA80 models. Booklets, "The MIK06 Programming Workshop" and "The MIK11 Super-Emulator MSID" present dozens of applications for the CA80.

The CA80 literature helps even elementary school students to learn fast the microprocessor technology of control and management even without the aid of an instructor. The CA80 users have confirmed that in

hundreds and hundreds of enthusiastic letters which may be obtained from the MIK company. The MIK11 includes 120 of them. Here are two examples:

1. I am sincerely grateful for your MIK01 and MIK02. They are really very well written. Although the package came only two days ago, I was able to read both of them—it was very hard for me to pull myself away from them. I am currently a freshman at the School of Electronic Technology...

2. I am entranced by your books on microprocessors. The books are written with exceptional clarity. The very best educational institutions in this country—and I am a graduate of one of them—should envy you your methods.

The above already shows that the CA80 literature provides an absorbing lesson for both a fifteen-year old and a college graduate alike. The author of the MIK handbooks is a graduate of the College of Power Engineering and of the Warsaw Polytechnic (department of electronics). As an "apprentice" he came across many atrociously written handbooks which included thousands of irrelevant details that were remote from reality and as a rule, quite obsolete.

The CA80 documentation tries to provide the reader with extensive information on the topic of electronics and microelectronics in a completely different form than the method used in school textbooks. The CA80 microcomputer is designated for control. Its brain consists of a special management program which the experts call the MONITOR (2kB). This program facilitates the writing and setting up of one's own programs, considerably simplifies communication with the keyboard, screen and tape recorder, and serves as real-time clock. The CA80 communicates with any tape recorder, and as concerns control, its programming in the language of the assembler is unequalled.

Dozens of various programs for the CA80 are now available. They are written in the EPROM memory with a total of 26 kB, for instance, digital stopwatch, two alarms, and optional playing of any melody (which may be easily programmed by the user) with time-setting; programmed turning of five appliances on and off for a period of one year; calculation of the day in the week for any date from the year zero to year 9999; simple setting of computerized school bell and sports scoreboard; programmer for EPROM memory; four-function calculator; computer frequency meter up to 100 MHz; timer with up to 0.000001 second accuracy; dark-room control; computerized control of lights with very extensive options for the keyboard control; electronic organ with memory; control of stepping motors. In addition, quite a few games written mainly for the users of the CA80 computer are currently available, among them chess, checkers, Star Wars, Mastermind, Obstacle Course, Moving Target, Ring and Cross, Follow Me, Reflex, Test of Velocity of Visual and Aural Reaction, Biorhythm Calculations, and Dice Throw.

The most interesting of the above programs will be presented on the pages of RADIOELEKTRONIK.

The latest product of the "MIK" company is the MikSID super-emulator which very rapidly activates any control based on the Z80 microprocessor, operating in in-coming conditions and at full speed—even 10 MHz! The processes of the MiKSID are controlled by a computer of the IBM PC class using standard RS232C circuits. The MikSID super-emulator offers powerful programming (computer instruction code about 100 kB) plus specialized emulation probe regulating a pair of activated controls. The programming is above all a standard "debugging" program which, however, does not apply to the master computer (IBM PC) but to the activated control.

The following are ensured:

—program traps;

—hardware and program stepping operation;

—check and modification of internal registers of the processor;

—check and modification of in/out ports and of memory cells;

—comparison of memory capacities;

—registration of specified byte paths to any in/out port with specified velocity;

—listing of any memory range in the 16, ASCII or binary systems;

—search for a given byte path in memory;

—tracing of major program loops;

—making corrections with the aid of the line assembler.

It makes it possible to use symbols from an activated program and moreover, to use symbols as header labels defined in a further part of the corrections. Furthermore, automatic overshoot into a free RAM area is accessible, which is useful when the program must be "extended" because of corrections.

—disassembly of any memory area with reproduction of symbols and labels used in the program;

—fast loading of the instruction code of the activated program from the disk into the memory of the control, and vice versa;

—loading of any file (or its part) into the programmer, for example, for the purpose of programming into EPROM memory;

—optional use of the built-in programmer of EPROM memory;

—optional notation of the history of activated programs on the disk or printer;

—option of simultaneously activating of two self-contained controls;

—optional step backward while the program is being set up;

—built-in demonstration program;

—option of easy writing of the user's own demonstration programs representing actual operations of the controlled system.

We write the root program in the language of the assembler of the Z80 microprocessor for activation of the control with the aid of any editor. Our written program is transmitted through the most popular translator of the MACRO-80 assembler (for the Z80 and 8080) made by the Microsoft Company. We activate the instruction code of the program by MACRO-80 in entry conditions and at full speed with the aid of the above-described debugging program.

In addition, the "MIK" company offers complete universal CA80, CA82 microprocessor controls with basic programming in the form of 18 complete tested systematic procedures outstandingly facilitating communication of the program, if need be, with the keyboard, the seven-segment display or a tape recorder.

In December 1991, the cost of the MiK300 system including a set of discs and components for the assembly of the new CA80—from the tiniest screw to the frame and the feeder cable—made by the "MIK" company was only Zloty 445,000.

The MSID super-emulator was available at Zloty 3,900,000—and for schools, at only Zloty 2,500,000. Current prices are listed in the company's catalogue which we shall mail upon the receipt of a self-addressed stamped envelope plus stamps. "MIK" Stanislaw Gardynik, Olszowa Street 68, 05-090 Raszyn.

[Diagram - key]

1. Z80A CPU Microprocessor;
2. 0000H+3FFFH EPROM with MONITOR program;
3. 4000H+7FFFH EPROM or RAM;
4. 8000H+08FFFH EPROM or RAM;
5. 0C000H+0FFFH RAM;
6. User's 8255 in/out port;
7. User's Z80A CTC;
8. 8255 in/out port of the system;
9. Connection of the ZU50 user 8255 and Z80A CTC total available to the user;
10. Tape recorder;
11. Block diagram of the CA80 microcomputer.

TELECOMMUNICATIONS

Hungary's Kontrax, Finland's Helsinki Telephone Sign Contract

92WS0538A Budapest COMPUTERWORLD/ SZAMITASTECHNIKA in Hungarian 14 Apr 92 p 1

[Article by Sandor Mester: "Kontrax Telekom; Alliance With the Finns"]

[Text] Kontrax Telekom and the Helsinki Telephone Company signed a contract last Monday at the Budapest Hilton hotel which is unique in Hungarian telecommunications. The two private firms agreed to cooperate in the development of Hungarian telecommunications for 10 years. The Helsinki Telephone Company, formed 110 years ago, has the expertise to be of aid to Kontrax Telekom.

At a press conference held on the occasion of the signing of the contract Gabor Dicso, president and director general of the Kontrax Commercial Company, said that his firm had decided three years ago to begin activity in the area of telecommunications as well. They began by selling a family of telephone sets and then signed a contract with the Kokia Data Communications firm for sale in Hungary of digital telephone subexchanges. Later they expanded the offering with similar products from Ericsson. The organization of Kontrax was transformed in May 1991. The Kontrax Telekom Company is one of several joint stock companies which were created.

The chief of Kontrax regards the creation of the First Pest Telephone Company as a milestone. Matav [the Hungarian Telecommunications Enterprise] is among the founders (see issue 51, 1991, of our journal). "We must enter the world of public telephone networks," Mr. Dicso said, formulating the strategic direction of Kontrax Telekom. He said that the new management of Matav, directed by Pal Horvath, "like the former Communist leaders" is trying to "break up the monopolies from within."

Mr. Dicso emphasized that Kontrax is short of only one thing, experience. They talked with several world firms, including the Japanese NTT, to find a partner in this area. Finally the choice fell on the Helsinki Telephone Company, which readily offered its aid in creating the experiential background indispensable for dynamic growth.

Kurt Nordman, president of the Finnish partner firm, said that in his country there are 49 telecommunications companies in private hands. The number of lines operated by the private firms reaches 2 million, which is 75 percent of all lines. The remainder are operated by the state-owned Finnish telecommunications enterprise.

Pal Szoke, president of the Kontrax Telekom Company, said that his enterprise is preparing for a buyer's market, so they consider it important to master service provider's expertise as soon as possible. "We will try to get a 20 percent market share in telecommunications," he said.

"How much will the Finnish friendship cost Kontrax and what is the Helsinki Telephone Company risking?" we asked. Mr. Dicso said that Kontrax will pay for the consulting activity of the Finnish experts. Mr. Nordman gave an evasive answer, and after the press conference one of his colleagues, director Jukka Alho, said that the contract formulates broad frameworks of cooperation. Answers to concrete questions can be given only hereafter.

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